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Anatomical and Mechanical
LECTURES
UPON
DANCING.

WHEREIN
RULES and INSTITUTIONS
for that ART are laid down and
demonstrated.

As they were Read at the
ACADEMY in *Chancery Lane.*

By **JOHN WEAVER,**
Dancing Master. *N.*

Spartam quam actus est, hanc ornat.

L O N D O N :

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Garden. M.DCC.XXI.

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DANCING.



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ACADEMY in Chemistry Lane.

3 JOHN WEAVER

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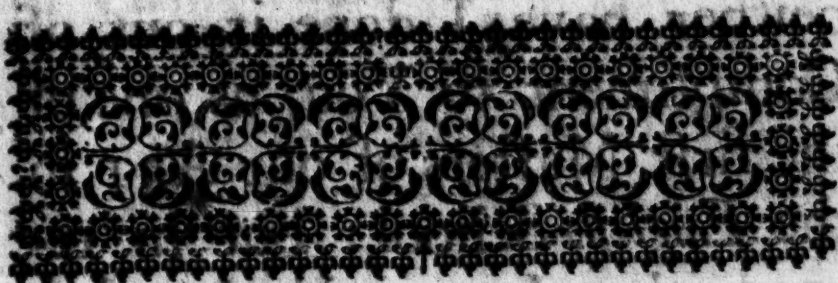
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M.DCC.XXXI.

Please here to acknowledge



TO
Mr. CAVERLEY.

SIR,

THE Motive that prevail'd on me to offer this *Dedication* to You, was not grounded so much upon a Principle of Gratitude, in return for Favours already receiv'd, which I take a

iv DEDICATION.

Pleasure here to acknowledge ;
neither have I done it out of
Compliment to You, as one of
the first Masters of our ART in
the *English* School : But in re-
gard, that I receiv'd the first
Hints of these ensuing Lectures,
which encourag'd this Under-
taking, from the Success I had
observ'd in the Method You
have introduc'd in Teaching.

WEIGHING nicely this Regu-
larity and Conduct, that You
have with so much Ease and
Pleasure reduced to Practice, it
soon prevail'd upon my Reason
to believe, That the ART of
DANCING, by due Study and
Application, was capable of such
Improvements, which in Proceſs
of

DEDICATION.

V

of Time, would not only make it Valuable, as it is now known to be Necessary and Useful, but render it worthy the Regard and Consideration, as well as Reflexion, of the learned World; since so many *Arts* and *Sciences* are conducive to its Perfection.

WHAT I have here barely attempted in *Theory*, You have already demonstrated in *Practice*; and Your incomparable Method evidently shews You have the certain Rules of the ART, that make You so happy, as to answer the Expectations of all who have confided in You; and I perswade my self, that in the following Sheets I have shewn, That this Theory is derived from that

vi DEDICATION.

Practice and Method, now in Use by You, and others the eminent Masters in this ART, from whence the Education of our young Gentlemen and Ladies have taken a much more advantageous Turn.

Your Excellence in the Art You profess; Your distinguishing Humanity; Your disinterested Friendship, and other agreeable Qualifications, gain You the Esteem of all the Ingenious in our ART, and make You valuable to all Mankind that know You.

I am, SIR,

Your most obliged,

Humble Servant,

J. WEAVER.

PREFACE

THES'E ensuing Lectures were attempted, in order towards the introducing the Art of Dancing among the liberal Arts and Sciences; by laying down Fundamentals, and Rudiments, explaining the Laws of Motion, Mechanical and Natural, so far as they relate to the Regular, or Irregular Position, Motion, and Gesture of the Body, and Parts thereof.

AND, these Endeavours could not have been better tim'd, than, when the Art of Dancing is arriv'd to so great an Excellence; and when its Professors, and Masters, are become so eminent, that those who employ them, are sensible, and daily confess, the vast Improvements they find in the Shape, Strength, and graceful Address of their Children, from this admirably well adapted Exercise for Youth; in which the Growth
of

of Infancy is encourag'd; the Beauty of a well regulated Motion is discover'd; and the Vigour of the Body is promoted; so that the Art of Dancing is not only of the greatest Concern to Beauty; but of the last Consideration to Health, which is one of the greatest Blessings we enjoy.

THE two first Lectures, which are Anatomical, may not, perhaps, be so well relish'd by the Masters in Dancing, at first View; but with a little Consideration they will find (to go no farther) the Description of the external Parts of the Human Machine; the wonderful Structure, and Position of the Bones; the Force, and Actions, of the Muscles; to be not only worth their Observation; but of great Use towards illustrating the following Discourses.

As to Proportion, and Symmetry of Parts; 'tis absolutely necessary we should be well vers'd in them, that we may be capable of adding Grace and Beauty to the Position and Motions of a proportionate Body; and the more readily correct such Defects, as may arise from the Misformation of the Parts, or are contracted by Ill Habits, &c.

THE Mechanical Parts, upon Standing; Walking; and Springing; are partly taken from the Propositions of the learn'd BORELLI, de motu Animalium, &c.

AND as these are the very Fundamentals of our Profession, so they deserve, nay, require, our utmost Observation; for, from the Regular or Irregular Position, and Motion of the Body, we
distinguish

distinguish the handsome Presence, and Deportment of the fine Gentleman, from the awkward Behaviour of the unpolish'd Peasant; we discover the graceful Mien of a young Lady, from the ungainly Carriage of her Maid; and this Regulation even stamps Impressions on the Mind, which we receive from the outward Figure of the Body; for as the Soul is inform'd from the external Objects of Sensation, how careful ought we to be, to give the most agreeable Impressions, which cannot be affected without this Regularity; and how commendable, how advantageous it is, for a Gentleman, or Lady, to be Adroit at every Step, and, that every Motion, and Action of the Body, be consonant to Symmetry and Grace. 'Tis an elegant Way of touching the Passions which we call Address; and, which renders the Person at first so agreeable.

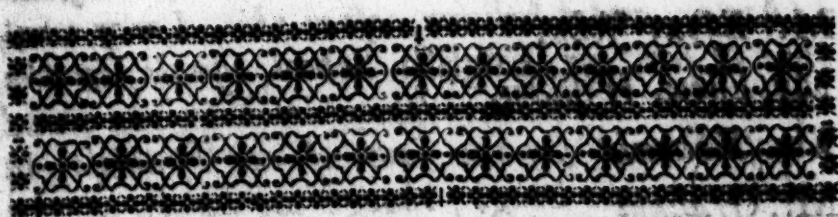
IN laying down Rules and Institutions in Dancing, I would not be thought to have invented such Rules, or, to have advanc'd Institutions, altogether before unknown to the Masters eminent in this Art; for (among many Examples) to mention only Mr. DE LA GARDE'S two Children, who, almost every Body has seen; 'tis plain, that they could never have arriv'd to so great a Perfection and Correctness in the Art, but from the regular Instructions of their Master; nor could Mr. De la Garde have instill'd such Rules, and Principles of Dancing, into those young Subjects, had he not receiv'd his just Notions, and first Instructions, from that great Master

PREFACE.

Master in every Branch of this Art, Monsieur L'Abbé; and I believe, after this, I may venture to say, our English School equals, in the instructive Part, any Place in EUROPE; and I wish I could say the same of our Practise, in relation to the Stage; though we have, at this Time, a better Set of Performers in ENGLAND, than, perhaps, it could ever boast of before; yet we may value our selves, that we have a Dancer in the Person of Mrs. BOOTH, where Art and Nature have combin'd to produce a beautiful Figure, allow'd by all Judges in our Art to be the most graceful, most agreeable, and most correct Performer in the World.

To conclude, as Arts and Sciences have receiv'd no small Additions, and Improvements, from the Genius of the English Nation; so I am in hopes some better qualify'd, may improve and compleat what I have but began; and should be oblig'd to any of our Profession, or any other, who would rectify or amend any part of these Lectures; and correct wherein I have erred; or supply any Deficiency in this Undertaking.





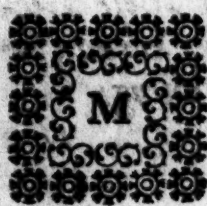
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LIST

OF THE

DANCING MASTERS

SUBSCRIBERS to this
UNDERTAKING.



R. L'Abbé

Mr. Ayleworth

Mr. Barton

Mr. Beardwell of OXFORD

Mr. Birkhead

Mr. Caverley

Mr. Couch

Mr. De la Garde

Mr. Eastland of St. EDMONDS BURY

Mr.

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 Mr. Firbank
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 Mr. Holt, Walter,
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 Mr. Lally, Edmund,
 Mr. Lally, Edward,
 Mr. Orlabee
 Mr. Pemberton, Edmund,
 Mr. Pemberton, James,
 Mr. Shaw
 Mr. Shirley
 Mr. Stagg of the BATH
 Mr. Topham
 Mr. Tyrill
 Mr. Wade

INTRODUCTION.

It is expected, perhaps (*Gent.*) that by way of Introduction to these Lectures, I should say something in Behalf of this **UNDERTAKING**; and in respect to that *Art* which we profess.

BUT as I have already treated on the *Art* of *Dancing*, in relation to its Usefulness as a Qualification and Exercise, I shall refer to that, and only beg leave to observe, that I was incited to this Attempt (in a great Measure) as I did imagine, it might be a Means of recovering our *Art* from a Contempt unjustly cast upon it, by those who term it only a trifling Amusement.

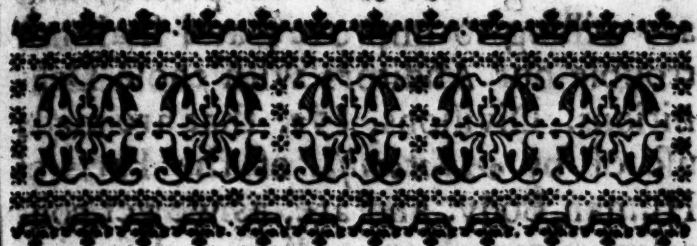
NOT but that you *Gent.* of the Profession (and it is with great Pleasure I speak it) by the great Improvements you have made in this *Art*, as to the Method of Teaching; your prudent Conduct and Management, of those (especially the
B Ladies)

2 INTRODUCTION.

Ladies) under your Care ; your obliging Behaviour to all ; and the good Order, and Oeconomy, you have introduc'd into our Boarding Schools, have already rais'd our Art to a much higher Pitch of Reputation, than it formerly appear'd among us.

So that I flatter my self, this Undertaking will derive to our *Art*, that Esteem so justly due to its Merit, and establish a Reputation equal to its Desert ; when the Art of *Dancing* is set in such a Light, as may make it appear to the Ingenious, to be not only useful, and absolutely necessary to all ; but also, that it is not unworthy of being introduc'd among the liberal Arts and Sciences, since we shall be able to prove, That the Rules and Institutions of our Profession are built upon the Fundamentals of *Anatomy* ; agreeable to the Laws of *Mechanism* ; consonant to the Rules of *harmonical Proportion*, and adorn'd with the Beauty of a natural and cultivated *Gracefulness*.

Ana-



Anatomical and Mechanical
LECTURES
 UPON
DANCING.

IS the Human Body, the most perfect of all others, and the Master-piece of Nature, will have the greatest Share in the Subject treated upon in the ensuing Lectures; I am perswaded, nothing can be more agreeable to us, than a View of the Component and External Parts thereof, as they appear in the Living State. But since We do not intend an intire Course of Anatomy, we shall confine our Observations only to those peculiar Parts, which are absolutely necessary towards

On the Parts of the Body.

cultivating that Art we profess, and are willing to improve; and shall not trouble our Auditors with those Definitions, Divisions, &c. that are made use of by *Anatomists* of the Parts of Human Body, and are, as we yet conceive, altogether needless and foreign to our Design.

WE shall divide the Body into four
 Caput. Parts (*viz.*) the *Head*, the *Thorax*,
 Abdomen the *Belly*, and the *Limbs* (that is to
 say) the *Legs* and *Arms*.

THE *Head* is the noblest Part of the Body, as containing the *Brain*, wherein the Rational Soul more especially operates, and whereby all the animal Motions of the Body are moderated and determin'd.

IT is seated in the uppermost Part of the Body, because there the Organs of the Senses are seated; and from so advantageous a Situation, the Eyes, as from an Eminence, behold Objects distant and remote: The Ears receive the various Sounds that circling rise and fly aloft: And the Nostrils attract and draw in the ascending Odors.

THE *Head* is divided into two
 Calvaria. Parts (*viz.*) that which is *Hairy*, and
 Cranium. that which is *Smooth*; the former is
 call'd the *Skull*, and the latter the *Face*.

THE

On the External Parts.

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THE Parts of the *Hairy Scalp* are Four; the Fore-part, the Hind part, and two *Temples*: In the middle is the *Tempora*. *Crown*, situated on the Top of the *Vertex*. *Head*.

THE smooth Part is call'd the *Face*, and this is well worth our Observation; for here most of the Senses are lodg'd, and the Face may not improperly be term'd the Image of the Soul: Anger and Scorn are seated on the Brow: The Eyes express the Sentiments of the Heart; and every Passion of the Mind is discover'd in the Countenance: Here too, in Females, the irresistible Charms of Beauty reign, tyrannize, and triumph, over the Heart of Man. The *Face* comprehends all that Part which begins at the Fore-part of the Head, where the Hair *Frons*, ends, and terminates at the *Chin*: The Parts of the Face are the *Brow*, or *Forehead*; the *Ears*, the *Eyes*, the *Cheeks*, the *Nose*, the *Philtrum*, and its side; the *Lips*, the *Mouth*, and the *Chin*. I cannot but observe to you, That the Skin of the Forehead is only Moveable, on which appears certain Lines, which, when the Forehead is contracted, are call'd *Wrinkles*.

UNDER the Head you see a certain Round and Oblong Part of the

On the External Parts.

Figure of a Cylinder, extending downwards to the Shoulder, and plac'd betwixt the upper and lower Regions of the Body, which is call'd the *Neck*: It reaches from the Head to the *Channel Bones*, and is divided into the Anterior and Posterior Parts: The Anterior, or Fore-part, is the *Throat*, along which descends the *Wind-pipe* and the *Gullet*: The Posterior, or Hind-part of the Neck, reaches from the Hind-head down to the *Shoulder Blades*.

NEXT, immediately under the Neck, is the *Thorax*; it is distinguish'd into three Parts, the Anterior, the Posterior, and the Lateral: The Anterior, or Fore-part, is call'd the *Breast*, or *Chest*, on which are the *Channel Bones*. On the Fore-part of the *Chest* are plac'd the *Breasts*, which are two round *Glandular Tumors*; they are much larger in Women than in Men: The small and round Prominency in the Centre is call'd the *Nipple*, which is encompass'd with a reddish Circle, call'd *Areola*.

THE Posterior, or hinder Part of the *Thorax*, which is seated opposite to the *Breast*, is call'd the *Back*; it begins at the Neck, and reaches down to the end of the *Ribs*, and to the beginning of the *Loins*: It is compos'd of twelve *Vertebrae*,

Collum.

Claviculæ

Jugulum.

Trachæa.

Oesophagus.

Scapulæ.

Pectus.

Claviculæ

Mammæ.

Papilla.

Dorsum.

Costæ.

On the External Parts.

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bra, or Joints; and the *Shoulder Scapulae*.
Blades. The *Shoulders* are two superior Prominencies arising from the broad Bones of the *Shoulder Blades*, and form the upper part of the Back; and the *Vertebrae*, or spinous Protuberancy, extending all along the whole length of the Back, divide it into the right and left Parts.

THE two lateral Parts are plac'd betwixt the Anterior and the Posterior: They begin under the Arm-pits, and terminate with the Ribs; so that these *Lateral*, or Sides, are distinguish'd into the Right and Left.

THE third Part is seated in the lowermost Part of the Trunk of the Body, and is of a soft and carneous Substance, it is call'd the *Belly*.

Abdomen

It is distinguish'd into the Anterior and the Posterior Parts: The Anterior begins at the lower Point of the *Breast*, and extends to the *Pudenda*, and is call'd the *Belly*. The Posterior is the hinder Part, or Back-side; it reaches from the last Ribs to the Extremity of the *Os Sacrum*: It is divided into two Parts; the upper is call'd the Small of the Back; its Sides the Loins; and the lower End the *Anus*; and its Sides the *Buttocks*, which are very large, and of a fleshy Substance.

Venter,

Nates,

WE call those Parts of our Body, which branch out from the Trunk, like the Branches of Trees, the *Artus* or *Limbs*: These are the *Hands* or *Feet*. The first are divided into three principal Parts (*viz.*) the *Arm*, the *Cubit*, and the *Hand* (properly so called): The *Arm* is that part, which beginning at the Joint of the Shoulder, reaches to the next Joint, or the *Flexura* of the Elbow, which is the Place where we bend our Arm; opposite to which is the Tip of the Elbow. The *Cubitus* or *Fore-Arm* are those Parts, which from the Extremity of the *Arm* extend to the *Wrist*, or to the *Hand*, properly so call'd: And this *Hand* begins at the Extremity of the *Cubitus*, and terminates at the Extremity of the *Fingers*. The *Hand* is sub-divided into three Parts (*viz.*) the *Carpus* or *Wrist*, the *Metacarpus* and the *Digit*i: The *Carpus* or *Wrist* is that Part of the *Hand* which is next adjacent to that part which joyns the broad part of the *Hand* to the Elbow. The *Metacarpus* is situated betwixt the *Wrist* and the Root of the *Fingers*: The inside is the *Palm* of the *Hand*; the outside is call'd the *Back* of the *Hand*: On each *Hand* there are five *Fingers*, two of which have obtain'd their Names

On the External Parts.

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Names from the Magnitude, and the other three have theirs from their Position and Function: The *Thumb* is so call'd, because it exceeds in Bigness and Strength all the rest; the other *Finger*, that has borrowed its Name from its Magnitude, is the *Little Finger*; the next to this is call'd the *Middle Finger*; the other is call'd the *Ring Finger*. On the Extremity of the *Fingers* are *Nails*.

THE whole *Leg* is the next and last that comes under our Observation, upon the External Parts of Human Body. Under this Name is comprehended all that Part, which beginning at the *Buttocks*, reaches to the utmost Extremities of the *Toes*, and which is divided into three Parts (*viz.*) the *Thigh*, the *Leg*, and the *Foot*, properly so called: The first Part, which is the *Thigh*, is from the *Hip* to that Joint, of which the Fore-part is call'd the *Knee*, and the Back-part the *Ham*; and the Space between the two *Thighs*, which is adjacent to the *Buttocks*, is call'd the *Perinaeum*.

THE second Part of the *Leg* has its Fore-part, nam'd the *Shin*, and the Back-part, the *Calf* of the *Leg*: On the superior Part of the *Leg* is a Joint, where it is articulated with the *Thigh Bone*, which is call'd the *Knee*. In the

Pollex.

Minimus.

Nates.

Femur,
Tibia,
Pes.

Genu.

Rotula.

the Fore-part (or rather the Bone it self) that covers the Knee, is the *Knee-Pan*. In the lower Part, where the *Leg* is joined with the *Foot*, there are two Eminencies, which are call'd the outer and inner *Ankles* of the *Foot*.

THE third Part is the *Foot* (properly so call'd) which beginning at the *Leg*, ends at the very points of the *Toes*. It is divided, like the *Hand*, into three Parts (*vis.*) the *Tarsus*, *Metatarsus*, and the *Toes*. The *Tarsus* is from the *Ankles* to the *Metatarsus*; the *Metatarsus*, or Breadth of the *Foot*, goes to the Root of the *Toes*; the upper Part of the *Foot* is call'd the *Instep*, and the under Part is call'd the *Sole* of the *Foot*. The third Part contains the *Toes*, which correspond to the *Fingers* of the *Hand*.

THE whole Strength of the *Foot* rests on the Great *Toe*, in *Dancing* or *Vaulting*.

HAVING describ'd unto you the External Parts of the Human Body, I shall endeavour to speak concerning the Bones, as the Basis and Foundation-Pillars of the Body: But before I enter upon the Particulars, as the *Position*, *Beginning*, *Termination*, and *Figure* of these Parts, it will be requisite

On the Bones in General. 11

Let us first to premise a Word or two in General concerning the *Bones*, as to their *Nature, Uses,* and *Differences*.

A *BONE* is a Part of the Body that exceeds all the other Parts in Hardness, and Driness, and is form'd for the Support or Defence of the other Parts. The *Bones* are made of hard Fibres fasten'd to one another, by small transverse Fibres; and all those *Bones*, which are of any considerable Thickness, have either a large Cavity, or else small Cells; they are also cover'd with a thin, strong, and very sensible Membrane, call'd the *Periosteum*: Each of the larger *Bones* is bigger at its Extremities than in the middle, for the better Articulation of the Joints: But because the middle of the Bone requires a sufficient Strength, both to support the Weight of the Body, and to resist any outward Violences, the Fibres here are very close and compact, and the Bone is hollow within, and consequently not so easily broken, as it must have been had it been solid and smaller.

As to the Uses of the *Bones*, they are not only a Support and Foundation of the Body, and a Defence to the vital Parts from external Injuries; but they also impart Shape and Figure to the whole Body, and are aiding to, and facilitate the Action of a certain Organ.

As to their Figure, some are like a Triangle, as the *Scapula*, or *Shoulder Blades*; some Quadrangular, as those of the Forehead; others

others a Pentagon, as the Hind-part of the Head; one like a Cube, another like a Boat; and the *Clavicula* like a crooked Nail, &c.

As to their Substance, some are hard as the *Tibia*; others less hard, as the *Vertebra*; and others soft and spongy, as the *Sternum*.

A GREAT Diversity is also to be observ'd in the *Bones*, in respect to their *Meatus*, or Cavities, for some have a very large Cavity, as containing the Marrow; others have small Caverns, spongy, like a Pumice Stone, and some have Holes for the Passage of the Vessels, &c.

A CONSIDERABLE Variety is to be seen, in reference to their Magnitude; for some *Bones* are very large, as those of the Thigh, Leg, and Arm; others less, as the *Radius* and the *Cubitus*, and those of the Head; and some still lesser, as those of the Fingers, &c. Some, again, are long and slender, and others broad, &c. The Magnitude of the *Bones* does not only differ in Men of different Stature, but also in those who are alike in Height; and it happens sometimes, that among the latter, you shall see their *Bones* differ very much in bigness; and if Beauty depends on the slenderness of the *Bones*, such as have the smallest, must, according to this Rule, be best shap'd; and certain it is, that one Reason why Women are, generally speaking, much handsomer than the Men, is, because the *Bones* of their Face are smaller, and finer made, than those of

On the Bones in General. 13

of Men; from hence it follows, That the Skeleton of a Woman will be easily distinguished from that of a Man. The Order of Nature is very peculiar in respect to their Number, being just as many, and neither more, or fewer, than are requisite to perform the Functions in the Parts. I shall conclude these Differences of the *Bones*, with their Difference as to Motion; some have a more manifest Motion; others have a less, as those of the *Tarsus* and *Carpus*; others none at all; as those of the Head.

ON the external Surface of the *Bones* there are several Cavities and Protuberancies: The Cavities are of two Sorts, either narrow and shallow, or wide and deep; the first is call'd *Glene*, the second *Cotyle*; and both of these Kinds that serve for Articulation, have a Prominency on their Circumference, call'd the Lip, unto which is fasten'd a circular Ligament, which incloses the Head of the Bone which they receive, and serves to strengthen the Articulation, and to prevent Luxations, which would otherwise frequently happen.

THE Protuberancies are also of two Sorts; (*viz.*) the *Apophyses* and the *Epiphyses*.

THE Bone has besides these another Part, call'd the principal Part, which is the hardest, and most solid part of the Bone, and takes up the greatest part of it, as in the *Femur*, or *Thigh-Bone*; all that lies betwixt the Extremities, which are the *Apophysis*, and *Epiphysis*,
is

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is the principal part of the Bone.

THE *Apophysis* is a Prominency, or Protuberancy, arising, or jetting from the Surface of the Bone, and made by the Fibres of the Bone, the Use of which is to facilitate the Articulation of the Bones, and ordain'd for the more commodious, and strong Insertion of the Tendons of the Muscles, and is usually call'd a Process.

THE *Epiphysis* is a Protuberance made by a small Bone, joyned, or set upon the Extremity of a bigger Bone, which, as we advance in Age, unite into one, but is generally more porous than the Bone it self, and is often call'd an *Apendage*: Its Use is to strengthen the Articulation, and to be serviceable, as well as the *Apophysis*, to the Insertion of many Muscles and Ligaments.

ALL their Difference is from their Figure. If the Protuberance be large and round, it is call'd *Caput*, the *Head*; and the Part immediately under it *Corvix*, the *Neck*; as in the superior part of the *Thigh-Bone*; but if it be small and round, then it is call'd *Condylus*; and if it be a sharp or pointed Protuberance, it is call'd *Corone*; others from their Figure take the Names of *Styloides*, *Coracoides*, *Ancryoides*, &c.

THE Bones are articulated, or joyn'd to one another, either with a manifest Motion, or with a small and obscure Motion, or without any Motion at all. There appears so much

Art

Art in the Conjunction of the *Bones*, that they have serv'd as Patterns to our Handicraft Tradesmen in their most curious Works. And were it not for such various Articulation, and Conjunction of the *Bones*, we could never move our selves so compleatly as we do.

THE first Sort of Articulation is call'd *Diarthrosis*, or loose Articulation; the second *Synchondrosis*; and the last *Synarthrosis*.

OF the *Diarthrosis* there are two Sorts, *Enarthrosis* or *Arthrodia*, and *Ginglymus*. The first is, when a round Head of a Bone is received into the round Cavity of another; such as the Articulation of the *Thigh-Bone* in the *Acetabulum Coxendicis*; or the *Shoulder-Bone*, with the *Scapula*: And this Sort of Joyning is call'd by Tradesmen Ball and Socket: The Property of this Joyning is, that the Parts so articulated are capable of all Sorts of Motion, as upwards, downwards, forwards, backwards, and circularly.

THE *Ginglymus* is, when a Bone both receives, and is receiv'd; and the Property of this Sort of Articulation is to admit only of the Motions of Flexion and Extension. It is call'd by Tradesmen *Charnel*, and is commonly us'd in Hinges. Of this Articulation there are three Sorts. The first, when the end of a Bone has two Protuberancies and one Cavity; and the end of the Bone with which it is articulated has two Cavities and but one Protuberance, as the lower part of the *O: Humeri*,
or

16 *On the Bones in General.*

or *Shoulder Bone*, and the *Ulna*. The second is, when a Bone at one Extremity receives another Bone, and at its other Extremity is receiv'd by the same Bone, as the *Radius* and *Ulna*. The third Sort is, when a Bone at one end receives another Bone, and at the other end is receiv'd by a third Bone, as the *Bones* of the *Vertebra*.

THE second Sort of Articulation, which is call'd *Synchondrosis*, is, when the Extremities of two *Bones* are joyn'd to one another by means of an intervening *Cartilage*.

A *CARTILAGE* is a smooth and solid Body, not so hard as the Bone, and harder than a Membrane; it is what we call a Gristle, and is Elastick, and if press'd, or forc'd from its natural Situation, will, when such Force is remov'd, return to its pristine State.

THE third Sort of Articulation is call'd *Synarthrosis*, of which we shall make no farther mention, as being no ways relating to our Purpose.

THE Extremities of the *Bones*, that are joyn'd together for manifest Motion, are tied and bound together with membranous Ligaments, which rise from the Conjunction of the *Epiphysis* with the Bone, and passing over the Articulation, are inserted in the other Bone at the same Place, and form a sort of Bag, which embraces all that part of the Extremities of both Bones which play upon one
and-

On the Bones of the Head. 17

another; in this Bag a Mucilage is contain'd, for the easier Motion of the Joint. The *Bones* articulated by *Ginglymus* have the Ligaments stronger on their Sides than before or behind, that the Protuberancies may play true in their Cavities, for if they might slip the least to either side, the *Bones* would be frequently dislocated.

THE whole Structure of the *Bones* being thus artificially joyn'd to one another, forms the Skeleton; the greatest part of which we shall in Particulars present to your View, and from them fully instruct our selves in all that will be requisite for us to know, in relation to this Day's Lecture.

THIS Skeleton we shall divide into the *Head*, the *Neck*; and *Trunk*, and the *Limbs*.

THE *Head*, so far as it is necessary to our Purpose, may be divided into the *Skull* and *Face*. The *Skull* is compos'd of several *Bones* forming a Cavity, which contains the Brain; but concerning the Figure of these *Bones*, or their *Foramina*, or *Sutures*, I shall make no farther Enquiries than is absolutely necessary to my Design, and for that Reason shall only mention the *Os Occipitis*, a large Bone forming the hinder Part of the Head, and which is articulated with the first *Vertebra* of the Neck, and to which the small Muscles for the Motion of the Head are fasten'd. This Bone has two *Apophyses*, which are lin'd with a *Cartilage*, and articulated with the first *Vertebra* of the

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the Neck: It has also a Protuberance in the middle, from which there goes a small Ligament, which is inserted into the first *Vertebra* of the Neck.

THAT Chain of *Bones* from the Head, composing the Neck, Back, Loins, Os *Sacrum*, and *Coccygis*, have altogether obtain'd the general Name of the *Spine*, and are call'd the *Vertebrae*; for since 'twas necessary the Head and Body should be variously mov'd, it was requisite their Supporter should not consist on one Bone only, for then that Bone would have been strait, and stiff as a Stake, without being capable of bending; nor would it have answer'd the Uses for which it was design'd, had its Composition been of two, three, or four *Bones*, for then of Necessity it must, when bent, have made acute Angles in all the Places of such Flexions and Articulations, and consequently have compress'd the Marrow of the *Spine*, and hinder'd the free Course of the animal Juice into the Extremities of the Nerves; therefore the Divine Architect has ordain'd and fram'd this wonderful Complex of many *Bones*, joyn'd and articulated together by strong Ligaments, by means of which it easily moves on all sides without incommoding in the least the *Medulla Spinalis*, which it contains, nor the Parts of the *Thorax*, nor of the *Abdomen*, which it touches.

THESE *Vertebrae* are in Number Twenty four (*viz.*) seven belonging to the Neck, twelve

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twelve to the Back, and five to the Loins, besides those of the *Os Sacrum* and *Coccygis*, which compose the posterior Part of the Spine. The Figure of the whole Spine, at first sight, seems to be strait, but rightly consider'd, we shall find that those of the Neck bends inwards, for the better Support of the Head and *Oesophagus*. Those of the Back bend outward, to enlarge the Capacity of the *Thorax* and *Abdomen*; and those of the Loins bend a little inward, to defend the great Vessels, and to support more conveniently the Weight of the Body. The *Os Sacrum* inclines outwards again, and the *Os Coccygis* inward.

As these *Vertebra* rise higher upward they lose insensibly their Bulk, so that the Column ends pyramidal. In each of the *Vertebra* there are two distinguishable Parts (*viz.*) the Body and the *Apophyses*. The Body is a bony Substance, porous and spongy, which adds to its Lightness; it is even and flat at its Extremities, the better to unite them, and to rest upon and support one the other: It is of a Convex Figure forwards; and backwards somewhat Concave, and plain above and below, each cover'd with a Cartilage which is pretty thick forward, but thin backward; by which means we bend our Bodies forwards; for the Cartilages yield to the Pressure of the Bodies of the *Vertebra*, which in that Motion come closer to one another, and gives them a more easie Motion; the Body also of each *Vertebra* in-

C 2 creases

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creases gradually in Bulk to the very *Os Sacrum*.

THE *Apophyses* or *Processes* are certain bony Elongations, harder and more solid than the Body, and which form the posterior Part of the Spine of the Back.

EACH *Vertebra* has seven of these *Processes*; four Oblique; two on the upper Part, and two on the lower Part; two Transverse or Lateral, on each side one, in each of which there is a Tendon of the vertebral Muscles inserted; and one Acute, called the Spine or *Spinatus*, and has given the Name of the Spine to the whole Column. Each of these *Vertebra* is also perforated in the middle by a large Hole; so that all the *Vertebra* being plac'd one upon another, and these Holes being plac'd exactly one to another, do form a long Conduit or Pipe, through which the spinal Marrow does pass, even to the very *Os Sacrum*: This Pipe is equally big at the one end as the other. These *Vertebra* have also five *Epiphyses*, two on the Body, two on the Extremities of the transverse *Processes*, and one at the Extremity of the pointed *Process*. These *Vertebra* are joyn'd to one another by a sort of *Ginglymus*, and their Bodies by *Synchondrosis*. Now, tho' the *Ginglymus* has no other Motion than Flexion and Extension, yet the Spine, by Reason of their Heads and Cavities, being flat and superficial, and their Articulations loose, move a little side-ways to the right and to the left.

THE

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THE two descending oblique Processes of each superior *Vertebra* of the Neck and Back, have a little dimple in their Extremities, wherein they receive the Extremities of the two ascending oblique Processes of the inferior *Vertebra*; so that the two ascending Processes of each *Vertebra* of the Neck and Back are received, and the descending do receive, except the first of the Neck. The Articulation, as I have observ'd before, made by the Body of the *Vertebra*, is a *Synchondrosis*, because it is made by means of a Cartilage, which facilitates and accelerates the Motions of the Spine, and prevents the *Vertebra* from rubbing one against another. The *Vertebra* are all fasten'd together by a hard Membrane, consisting of large and strong Fibres; the Channel or Concavity is also lin'd with a Membrane, and ties them all together. Thus much of the *Vertebra* in general, but shall only observe, That tho' the Motion of the whole Spine in general is very evident, yet that of each *Vertebra* in particular very inconsiderable. We shall now proceed to a more particular Examination.

THE Head moves only backwards and forwards upon the first *Vertebra*, and semicircular upon the second. A small Protuberance in the Bone of the Hind-head falling upon another in the first *Vertebra*, stops the Motion of the Head from falling too much backward, that it might not impair the spinal Marrow; and when the Chin touches the *Sternum* it can move no farther forwards. C 3 THE

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THE first *Vertebra* of the Neck is call'd *Atlas*, upon which the Head, like a little World, rests, and is most firmly united to it, and moves with it, upon the second, semicircularly; it has no acute or spinous Process, that it might not interrupt the Action of the small Muscle, call'd *Musculus Rectus*, which goes from the second *Vertebra* to the *Occiput*, but it has a small Tubercle only, unto which the small Ligament of the Head is inserted. Its ascending oblique Processes receive the Tubercles of the *Occiput*, upon which Articulation, which is a sort of double *Arthrodia*, the Head is mov'd only backward and forward; and its descending Processes receive the ascending Processes of the second *Vertebra*; it has a very little Body, and in the fore-part of its great Hole it has a pretty large *Sinus* or Cavity, to receive the *Dens* or *Tooth-like* Process of the second *Vertebra*; this Cavity is lin'd with a strong Ligament which fastens the aforesaid *Dens*, that it might not compress the *Medulla Spinalis*.

It has two small *Sinus*'s in its upper Part, in which the tenth Pair of Nerves, and *Vertebral* Arteries lye. Tho' this *Vertebra* is smaller than either of the rest, yet it is at the same time more hard and solid; for it was requisite it should be very thin to afford a larger Cavity for the Passage of the Marrow; and it was necessary the great *Foramen*, or Hole of this *Vertebra*, should be larger than any of the

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the rest, least the beginning of the spinal Marrow should be incommoded in turning the Head to one side, in which Action this *Vertebra* moves with the Head on the *Tooth-like Process* of the second *Vertebra*.

THE second *Vertebra* is call'd *Epistropheus* or *Dentata*, because in the middle, between its two oblique ascending *Processes*, springs a long, round, and hard Process, like a Tooth, call'd *Dens*, which is receiv'd into the aforementioned *Sinus* of the first *Vertebra*; and upon this Tooth, the Head, with the first *Vertebra*, turns half round as upon an *Axis*. The Extremity of this Process (which is somewhat unequal) is knit to the *Occiput* by a small, but strong Ligament. A Luxation of this is mortal, and when it happens the Neck is said to be broke, which arises from its Compression of the *Medulla Spinalis*. The oblique, or semicircular Motions, are limited by the Ligament which ties the Process of this *Vertebra* to the Head; and by those which tye also the first *Vertebra* to it.

THE third *Vertebra* is call'd *Axis*, and the four following have no particular Name, nor any peculiar Difference, only encreasing a little in bigness, having their lateral *Processes* broader than the rest, and forked; their *Spines* are also fork'd, for the strengthening the Connexion of the Muscles, except that of the last, beginning to grow somewhat like those of the Back. The Motion of these *Vertebrae* are

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not so manifest, yet greater than those of the Back, because their acute Processes are short and strait, and the Cartilages which are between their Bodies thicker. All these *Vertebra* of the Neck have two small Holes each, which lie in the Head of the transverse Processes, and thro' which the *vertebral* Arteries pass; and the superior oblique Processes are somewhat hollow to receive the inferior Convex ones, for the freer Motion of the Neck.

THE Back has twelve *Vertebra*, which are larger than those of the Neck, and smaller than those of the Loins; their spinal Processes are not forked, but pointed, and lie one over the other. The *Vertebra* of the Back have this peculiar to them, that on each side of their Bodies they have a *Sinus* very superficial, and invested with a Cartilage, wherein the round Extremities of the Ribs are receiv'd; and another superficial *Sinus* also invested with a Cartilage plac'd on their transverse Processes, which receives the little Tubercle near the Extremity of the Ribs. The Motion of these *Vertebra* of the Back is obscure, their Cartilages being thin, and their acute Processes long, and very near to one another; and they are fix'd to the Ribs which neither move forwards or backwards.

THE five *Vertebra* of the Loins differ from the rest in this, that they are the broadest, and the last of them the largest of all the *Ver.*

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Vertebra: Their acute Processes are broader, shorter, and wider from one another; their transverse are more long and fine than those of the Back, to support the Bowels and Muscles of the Back; they are not perforated as those of the Neck; nor have they a *Sinus*, or Dimple, as those of the Back: The Cartilages which are betwixt their Bodies are thicker than any of the rest. These Spines are not equal in their Magnitude in respect to one another; for as the *Vertebra* are bigger in their Bodies, as they are lower in Position; so, on the contrary, the Spines are bigger, as their Positions are higher; so that the biggest *Vertebra* have the least Spines, and the lowermost *Vertebra*, which is the biggest of all, has consequently the smallest Spine. These *Vertebra* belonging to the Loins are dispos'd in such a manner, as to be capable of all sorts of Motion; and the greatest Motion of the Back is perform'd by these *Vertebra*, because their Cartilages (as we observed before) are thicker, and their acute Processes at a great distance from one another, for the thicker the Cartilages are, the more we may bend our Bodies forwards; and the greater distance there is between the acute Processes, the more we may bend our selves backward.

‘ T H U S have we describ'd the admirable
‘ Structure and Motion of the *Vertebra* of the
‘ Neck, Back, and Loins, when they are in
‘ their natural Position; but in some People
‘ the

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the *Vertebra* are several Ways distorted; as
 if the *Vertebra* of the Back stick out, such
 are said to be hunch'd back'd; and, in such
 the Cartilage between the *Vertebra* are very
 thin and hard forward, but considerably
 thick backwards, where the oblique Proces-
 ses of the superior and inferior *Vertebra* are
 at a considerable distance from one another,
 which distance fills up with a viscos Sub-
 stance. This Inequality of the thickness of
 the Cartilages, happens either by a Relax-
 ation, or Weakness of the Ligaments and
 Muscles, which are fasten'd to the backside
 of the *Vertebra*; in which Case their Anta-
 gonists finding no Opposition, remain in a
 continual Contraction, and consequently
 there can be no Motion in these *Vertebra*:
 This Deformity has sometimes its Origine
 from the Womb; then the *Bones* being at
 that Time soft and tender, the Bodies of
 the *Vertebra* partake of the same Inequality
 as the Cartilages. If the Bunch be towards
 one Shoulder; for Example, towards the
 Right; then the Cartilages on that side are
 very thick, but thin and dry on the other
 side; on the left side the oblique Processes
 come close together, but on the right there
 is a considerable distance betwixt them; and
 the Ligaments and Muscles are greatly
 extended on the right side; but those on
 the left are as much contracted. If the
Vertebra are distorted inwards, all Things

have

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have a different Face. The Cartilages, and sometimes the *Vertebra*, are very thick forwards, but mighty thin and hard backwards. The acute and oblique Processes are very close to one another, and the Ligaments upon the Bodies of the *Vertebra* are greatly relax'd, but the Muscles and Ligaments which tie the Processes together are very much contracted. If these Distortions happen in the *Vertebra* of the Loins, the miserable Patient has little or no Motion in his Back*.

As the rest of the *Bones* belonging to the Trunk are without any Motion, it will be sufficient for us to know, that the *Os Sacrum* adjoining to the *Vertebra* of the Loins, consists of four, five, or six *Vertebra*, which in adult Persons make in effect but one large solid Bone of a triangular Figure, with the Point downwards; concave and smooth on its foreside, and convex and unequal on its backside; it's immoveable, and serves not only as a Basis and Foundation to support the whole *vertebral* Frame, but also gives rise to many Muscles. To the Extremity of the *Os Sacrum* is joyn'd the Bone *Coccygis*, by some call'd the *Rump Bone*; it is compos'd of two or three little *Bones* of a loose Articulation, ty'd to one another by Cartilages, the last is the smallest.

* Keil, page 265.

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THE Ribs are in Number Twenty four, twelve on each side of the twelve *Vertebra* of the Back; they are partly bony, and partly cartilaginous; they are crooked, concave inward, and convex outwards, and articulated by their Extremities both to the *Vertebra* of the Back and Breast; that with the Back is moveable, the other not: The seven superior Ribs are joyn'd to the *Sternum*, and the other five by Cartilages adhering to the superior. The Ribs defend the Heart, Lungs, &c. from external Injuries, and serve to sustain the Muscles of Respiration.

THE *Sternum*, or *Breast Bone*, is situated in the middle of the Breast; on its upper Part it has a *Sinus* on each side, which receives the Heads of the *Clavicula*: At its Top it has a lunated *Sinus* call'd *Jugulum*; below, on its sides, it has several *Sinus*'s, which receive the Extremities of the Ribs: At the lower End is annex'd a Cartilage pointed at the end, and call'd *Cartilago Xiphoides*; vel *Mucronata*; or *Ensiformis*; the Sword-like Cartilage. The *Sternum* is of a triangular Figure, and immoveable, it defends the Heart, receives the *Clavicula*, and unites the Ribs, that their Motion may be all at one and the same Time.

THE *Clavicula*, or *Collar Bones*, are two, and situated above the Breast, one on each side; at one end they are articulated with the *Scapula*, or *Shoulder Blade*, by *Synchondrosis*; and

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and at the other end to the upper part of the *Sternum*, by *Arthrodia*; their Figure is like an *Italian f*; the crookeder these Bones are, the more force and agility has the Arm: Their Use is, to uphold the *Scapula* and *Humerus* from falling on the Breast, and to facilitate the Motion of the Arm. And because the pectoral Muscle, which pulls the Arm across the Breast, is inserted near the upper end of the Shoulder Bone; therefore if the *Clavicula* did not keep the *Scapula*, to which the Head of the *Humerus* is joyn'd, always at an equal distance from the *Sternum*, the upper part of the Arm, and not the Hand, must have been pull'd forwards.

WE shall conclude with the Bones of the Trunk, in a Description of the *Os Innominata*, from their strange Figure. They are joyn'd to the Extremities of the *Os Sacrum*; and Anatomists divide each of these Bones into three Parts; the first and superior Part is called *Os Ilium*, from its External arise the *Musculi Glutai*. The second, *Os Pubis*. And the third, and inferior, the *Ischium* or *Coxendix*. This last has a large Cavity, call'd the *Acetabulum Coxendicis*, which receives the Head of the Thigh-Bone; the Circumference of this Cavity is invested with a Cartilage call'd its *Supercilium*, or Brow, where it joyns the *Os Pubis*: It has also a large Hole call'd *Foramen Ischii*, and *Pubis*, about the Circumference of which the Muscles *Obturator Internus*, and *Externus*, arise;

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arise; and at its lower end it has a large Protuberance, upon which we sit, and from whence the Benders of the Legs arise; and a little above this, upon its hinder Part, it has another small acute Process, betwixt which, and the former Protuberance, lies the Sinus of the *Ischium*, through which the Tendon of the *Obturator Internus* passes. These Bones are more ample and large in Women than Men.

THERE remains only now, that we proceed to an Examination of the Bones belonging to the Limbs, which we shall distinguish into the Arms and Legs. And first of the Arm, which is well worth our Observation and Consideration, in relation as 'tis an Organ, and Instrument given by Nature, not only to defend our selves, but as an Executor of our Will, and which gives us a Sovereign Power and Command over all Creatures.

THE Arm I shall divide into the *Scapula*; the *Humerus*, or Shoulder Bone; the *Cubitus*, or Cubit; and the Hand, properly so call'd.

THE *Scapula*, or *Shoulder Blades*, are two large and broad Bones, situated on the back-part of the *Thorax*; being only fasten'd with Muscles, except in its *Acromion*; and form the breadth of the Shoulders: They are of a triangular Figure; its outside is somewhat Convex, and its inside Concave: It has three Processes, the first runs along the middle of its outside, extending all its length, and is call'd the Spine. The Extremity of this Spine, that

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is articulated with the Extremity of the *Clavicula*, is call'd the *Acromion*. The second Process is a little lower than the *Acromion*, and is call'd *Coracoides*; it resembles a Crow's Bill; it strengthens the Articulation of the *Humerus*. The third is a short Process, which receives the Head of the Arm Bone; the *Sinus* receiving this Head is somewhat flat, and its Edges tip'd with a Cartilaginous Ligament, which prevents the *Humerus* from being too easily dislocated: This Process is call'd *Processus brevis*; its upper Edge is call'd *Costa superior*, and its lower *Costa inferior*; its broad end its Basis. The *Scapula* gives Origine to many Muscles, fastens the Arm to the Body, and serves to support it, that it may have all its Motions.

THE *Os Humeri*, or Shoulder Bone, is situated betwixt the *Scapula* and *Cubitus*, wherewith it is conjoyn'd both above and below; it is the strongest and largest of all that compose the Arm; it is long, and almost round, yet a little Convex on the outside, and Concave on the inside; its principal Part is of a very solid and compact Substance, and has a pretty wide and long Cavity in its middle, partly to contain the Marrow, and partly to make it less ponderous: It is thickest at both its Extremities, which are more porous and spongy.

AT its upper end it has a large round Head, invested with a very thick, pliable, and

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and slippery Cartilage, which is receiv'd into the *Sinus* of the Neck of the *Scapula*, and design'd for all the various Motions of the Arm; forward, backward, to the right, to the left, upward and downward; for it is articulated by *Arthrodia*, or Ball and Socket, as Tradesmen call it, which is the most perfect kind of Articulation, and adapted for all manner of Motion. That part of the *Humerus* immediately under its Head, is call'd the Neck, which is a very short *Epiphysis*, for the Insertion of the Ligament. Upon the fore-part of the Head there is a Channel, or Trench, through which passes a Tendon of the *Musculus Biceps*.

THE *Sinus*, or Cavity, that receives this Head, seems not to have a sufficient depth for it, which would have prov'd an Impediment to the various and ready Motions of the Arm: Provident Nature therefore, to prevent a Dislocation in this Part, has provided against this Inconveniency by strong Ligaments, and peculiar Form to this Head; and more particularly, by adjoyning another Cartilage to that which invests the *Sinus*, and forms a sort of Bag round the Head of the *Humerus*; but being fasten'd to it by Ligaments, begins with a thick Edge, but grows thinner by degrees, as it approaches towards the Centre. This Articulation of the *Humerus* within the Cavity of the *Scapula*, is very peculiar, and varies much from all others; for in the others, the Head of
the

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the Bone is receiv'd, and roll'd within a bony Cavity; but this Cavity of the *Scapula* serves only for a Support, or Prop to the Head of the *Humerus*, which is inclos'd within a membranous Case.

THE lower end of the *Humerus*, which is thinner and broader than the other, has two Protuberancies. Its interior and inferior Head is articulated with the *Cubitus*, or *Ulna*, by *Ginglymus*, and is by some call'd the *Trochlea*, from its resemblance to a Pulley; and its external Head is joyn'd to the *Radius* by *Artbrodia*, and invest'd with a Cartilage. On both sides of these Heads are certain Prominencies call'd Tubercles, design'd for the Origination of several Muscles. On the fore-part of the Protuberancies there is a small *Sinus*, which receives the anterior Process of the *Ulna*, and on the back-part there is another large *Sinus*, which receives the *Olecranon*.

THE *Cubitus*, or Cubit, which is the second Part of the Arm, consists of two Bones; the least of which is call'd the *Radius*, and plac'd on the outside; and the other is call'd the *Ulna*, and is on the inside of the Fore-Arm. The *Ulna* performs the Office of Flexion and Extension; and the *Radius* turns on the *Ulna* as on an *Axis*; the *Ulna* at that Time remaining unmov'd, and produces that Motion of the Hand, upwards and downwards, call'd *Pronation* and *Supination*. *Pronation* is perform'd; when the Palm of the

Hand

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Hand is turn'd down, and the Back is uppermost; and, on the contrary, when the Back of the Hand is undermost it's call'd *Supination*.

THE *Ulna* is a long and hard Bone, with a Cavity in the middle, and reaches from the Elbow to the Wrist. It is big at its upper end, and grows smaller to its lower end; at its upper end it has two Processes, which are receiv'd into the fore and hind *Sinus* of the lower Extremity of the *Humerus*. The foremost Process is small and short; the hindmost is bigger and longer, and terminates like a Beak, and is call'd the *Olecranon*; it prevents the Arm from falling too far outwards, beyond its strait Line, when extended at its full length. Betwixt these Processes it has a semicircular *Sinus*, which receives the inner Process of the lower end of the *Humerus*, upon which we bend, and extend, our Fore-Arm; and along the middle of that there runs a small Ridge, by which this Bone is articulated to the *Humerus* by *Ginglymus*; had the Articulation here been an *Artbrodia*, the Joint would have been much weaker, and the Hand could have receiv'd no more Motion from it, than it already has from the Shoulder.

THE Inside of this superior Extremity has a small *Sinus*, which receives the Circumference of the round Head of the *Radius*. Its lower Extremity, which is round and small,

and

and

and

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and of a smooth Surface, is receiv'd into a *Sinus* in the lower end of the *Radius* laterally, and upon this Extremity it has a short and small, and acute Process, call'd *Styloides*, from which the Ligaments, which tie it to the Bones of the Wrist, arise: This Process serves to keep the Bones of the Wrist in their Place.

IN the upper end of the *Radius* (which accompanies the *Ulna* from the Elbow to the Wrist) is a small, flat, superficial concave *Sinus*, which receives the convex Tubercle of the inferior Appendix, or lower Process, of the *Humerus*. The whole Circumference of this Cavity is very round and smooth, and rows in the small *Sinus* in the upper end of the *Ulna*. Near its lower end, which is bigger than its upper, it has a little *Sinus*, which receives the inferior end of the *Ulna*; and in its Extremity it has two Cavities, which receive two Bones of the *Carpus*, or *Wrist*. Altho' the *Radius* and *Ulna* accompany one another, yet do they not touch, but at their Extremities; they bend from one another in the middle, but they are tied together by a strong and broad membranous Ligament.

THE third Part of the Hand is divided into three Parts, the *Carpus*, or *Wrist*; the *Metacarpus*; and *Fingers*.

THE *Carpus*, or *Wrist*, consists of eight Bones, of different Figure and Bigness, dispos'd into two Ranks, four in each Rank; the first Rank is articulated with the *Radius*;

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and the second with the Bones of the *Metacarpus*; the last little Bone of the first Rank lies not at the side of the third, which answers to the Bone of the *Metacarpus* of the little Finger, as all the rest do, by one another, but it lies upon it: They are strongly tied together by the Ligaments which come from the *Radius*, and by the annular Ligament through which the Tendons, which move the Fingers, pass.

THE *Metacarpus* consists of four Bones, which answer the four Fingers; they are hard, solid, round, and long; a little convex and round towards the top of the Hand, and concave and plain towards the Palm: The Motion of these are very obscure, and I shall not therefore trouble you with them any longer, but proceed to the Fingers, which consist (together with the Thumb) of fifteen Bones in each Hand, three to each Finger, each of which is call'd a *Phalanx*, or Rank, for which Reason they are pliable, and adapted for different Motions. At the upper Part of each Bone, in the first *Phalanx*, is a Cavity, into which the Head of each of the Bones of the *Metacarpus* is articulated by *Arthrodia*, which is the Reason that the Finger is moveable on all sides. The second and third *Phalanx* are articulated both above and below by *Ginglymus*, whence 'tis they have no other Motions, excepting those of Extension and Flexion.

and the first Rank is articulated with the *Radius*

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WE shall divide the Leg, as we did the Arm, into three Parts (*viz.*) the *Femur*, or *Thigh-Bone*; the *Tibia*, or *Leg*, or *Shank*; and the *Foot*, properly so call'd.

THE *Os Femoris*, or *Thigh-Bone*, is single, and the longest and largest of all the Bones of the Body; it is solid and strong, and its Fibres close and hard; its Figure is oblong, but so as to be convex before, and somewhat concave behind; it has a Cavity in its middle, to prevent its being too ponderous, and to adapt it for the Marrow: It has also a long and small Ridge, call'd *Linea Aspera*, on its back-side, which runs from the uppermost, to the lowermost part; at its upper end it has three *Epiphyses*, the first is its Extremity, or upper Appendix of the *Thigh-Bone*, call'd its Head, which is large and round, and cover'd with a Cartilage, which is receiv'd in the *Acetabulum Coxendicis*, wherein it is tied by two Ligaments, one pretty large, and comes from the Edge of the *Acetabulum*; the other round and short, and inserted in the middle of the round Head. This Articulation of the *Thigh-Bone* with the *Hip-Bone* is by *Enarthrosis* or *Arthrodia*. The Part immediately below the round Head is the *Cervix*, or Neck of the *Os Femoris*; it is small, long, and a little oblique, and to which the *Ligamentum Latum* is fasten'd: It makes an Angle with the Body of the Bone, by which means the Thighs and Feet are kept at a distance from one another,

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and we stand firmer. The *Linea Propensionis*, or Line of Propension, easily falling Perpendicular upon any part of the Quadrangular Space between the Feet: But of that hereafter. Besides, this Obliquity of the Neck of the Bone, conduces much to the Strength of the Muscles of the Thigh, which must otherwise have pass'd very near the Center of Motion.

THE second is call'd *Trochanter Major*, and is a pretty big Protuberance, or Appendix, on the external side of the Thigh-Bone, just at the Root of the Neck; it is rough, because of the Insertion of some Muscles into it: It has a small Dent at its Root, into which the *Musculi Quadragemini*, and the *Obturatores*, are inserted.

THE third is call'd *Trochanter Minor*, and is on the hind-side of the *Os Femoris*, a little lower, and less than the other. These Protuberancies encrease very much the Force of the Muscles, by removing not only their Insertions, but likewise their Directions from the Center of Motion.

THE inferior Appendix of the *Os Femoris*, divided in the middle by a *Sinus* framing two Heads, is articulated with the upper *Sinus* of *Tibia* by *Ginglymus*. Thro' the Space between the hind-part of these two Heads, pass the great Vessels and Nerves which go to the Leg, because the upper end of the Thigh-Bone was articulated by an *Arthrodia*, that we might not only move our Legs backward or forward,

ward, but likewise nearer to, and farther from one another; therefore its lower Extremity was joyn'd to the *Tibia* by *Ginghymus*, which is the strongest Articulation.

IN the Knee there is a little round, and broadish Bone, about the breadth of two Inches, smooth on the out-side, and full of Holes, and somewhat convex, and invested with a Cartilage on the inside, and is call'd the *Rotula*, or Knee-Pan.

THE Use of the *Patella*, or *Rotula*, is not only subservient in Ambulation, but also to prevent the *Thigh-Bone* from thrusting out forwards, especially in walking down any steep Place, and from pressing on the Tendons of the extending Muscles of the *Tibia*; it also defends the Articulation of the *Thigh* and *Tibia*, especially in kneeling; and, like a Pulley, acts on the lower part of the *Thigh-Bone*, to extend the *Tibia* when inflected.

THE *Tibia* is the second Part of the Leg, placed betwixt the *Knee* and the *Foot*, and consists of two Bones, the inner and biggest, is called the *Tibia*, and the outer and less, the *Fibula*; they are both of a hard and solid Substance, excavated within, in the Nature of a Pipe.

THE *Tibia* is almost Triangular, and has on the fore-part of it a sharp Edge, called the *Shin*, or *Spina*. In its superior End it has two large *Sinus*'s, tip'd with a soft and pliable Cartilage, called *Cartilago Lunata*; it runs in

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between the Extremities of the two Bones, and becomes very thin at its Edge: It facilitates a small side Motion in the Knee. The *Sinus's* receive the two Protuberancies of the *Thigh-Bone*; by bending our Knee we bring our Leg, in walking, in a strait Line forwards, which, without this Articulation, we could not have done, but like those who have the Misfortune of having a wooden Leg, we must in going, even upon a Plain, have brought our Foot about in a Semi-circle, but more evidently so, upon an Ascent.

ON the side of this upper End it has a small Prominence, which is received into a small *Sinus* of the *Fibula*; and on its fore-part, a little below the *Rotula*, it has another, to which the great *Tendons* of the Muscles, extending the Leg, are inserted: Its lower end is much smaller than its upper; it has a remarkable Process, which forms the inner Ankle, and a pretty large *Sinus*, divided in the middle by a small Protuberance; the *Sinus* receives the convex Head of the *Astragalus*, and the Protuberance is received into the *Sinus* in the convex Head of the same Bone: It has another shallow *Sinus* on the side of its lower End, which receives the *Fibula*.

THE *Fibula*, tho' it be much smaller, is yet as long as the *Tibia*, it lies on the outside the Leg; on its upper End, which is not so high as the Knee, has a shallow Depressure in its inner side, which receives the lateral Knob

On the Bones of the Limbs. 41

Knob of the upper End of the Prominence of the *Tibia*; its lower End is received into the small *Sinus* of the *Tibia*, and then it extends into a large Process, which forces the outer Ankle, and embraces the external side of the *Astragalus*. The *Tibia* and *Fibula* touch only at their Ends; and the Space between them is filled up by a strong membranous Ligament, and some Muscles, which extend the Feet and Toes.

WE come now to the Foot it self, these, like those of the Hand, are divided into three Parts (*viz.*) the Bones of the *Tarsus*; *Metatarsus*; and those of the Toes: The *Tarsus* is composed of seven Bones, and is the Space between the Bones of the Leg and the *Metatarsus*. The first is called *Astragalus*, or *Talus*; it has in its upper Part a convex Head, which is articulate with the two *Fociles* of the Leg by *Ginglymus*, being it is divided by a little *Sinus*, which receives the small Protuberance in the middle of the *Sinus* of the *Tibia*; and without this Articulation, we must always, in going, have trod upon our Heel with our Fore-foot, and upon our Toes with the Hind-foot. The fore-part of the *Astragalus* is Convex also, is receiv'd into the *Sinus* of the *Os Naviculare*, below, towards the hind-part of its underfide; it has a pretty large *Sinus*, which receives the upper, and hind-part of the *Os Calcis*; but towards the fore-part of the same side, it has a Protuberance, which

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which is received into the upper and forepart of the same Bone.

THE second Bone of the *Tarsus* is the *Os Calcis*, or Heel-Bone, articulated to the *Astragalus* by *Ginglymus*, before to the *Os Cubi forme*.

THE third is called *Os Naviculare*, joyned to the *Astragalus*, and *Ossa Cunei forma*.

THE fourth, fifth, and sixth, are called *Ossa Cunei forma*, because they are large above, and narrow below, they are joyn'd to the *Os Naviculare* at one end, and at the other, to the three inner Bones of the *Metatarsus*.

THE seventh is called *Os cubi forme*, because of its Form.

THE *Metatarsus* are five Bones, they sustain the Toes, and are larger than the Bones of the *Metacarpus*; and as to the rest, are like them, and articulated to the Toes, as they are to the Fingers.

THE Bones of the Toes are fourteen, two the great Toe, the rest three each; they are like the Bones of the Fingers, only they are shorter.

IN the Toes, are found twelve *Ossa Sesamoidea*.



OF THE MUSCLES.

Of the MUSCLES in General.

BEFORE we proceed to a particular Description of the Muscles, it seems very proper that we first inform our selves of their Structure, and Composition in general.

ALL that soft Part of the Body, which we commonly call Flesh, is distinguish'd by Anatomists into various Parts, and Parcels; and to which they give the Name of Muscles.

A MUSCLE then, is a Bundle of fleshy and tendinous Fibres inclos'd in one proper Membrane, call'd *Membrana propria Musculorum*, which covers immediately all the Fibres
of

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of the Muscle; and is a Web of several Sorts of Fibres. By Means of these Muscles all the Motions in an animal Body are perform'd; and they are distinguish'd into three Parts (*viz.*) the Head, the Tail, and the Body, or Belly. The Belly of the Muscle is the middle Part of it, and is compos'd of fleshy Fibres, red, lax, and spongy, containing many *Vesiculae*, or small Cells: These Fibres are ty'd together by small short Threads, or little *Fibrillae*, which go from Fibre to Fibre, and are called Membranous Fibres. The Head and Tail are compos'd of tendinous Fibres, which are white, hard, compact, and closely bound together, and are less than the Body of the Muscle; but yet there are as many tendinous Fibres in the Head and Tail, as there are fleshy ones in the Belly of a Muscle. Each Muscle has Arteries, Veins and Nerves; either of which being ty'd, deprives the Muscle of the Power of contracting; but that Impediment remov'd they contract again.

MUSCLES are either Simple, or Compound; in the first all the fleshy Fibres run parallel to one another, as in the same Direction; in the latter they run in several Planes crossing one another, or of different Directions; and may be divided into as many simple Muscles as there are Planes, whose Fibres have different Directions: These Muscles resemble a Lozenge, or *Rhomboides*.

ALL

Of the Muscles that move the Head 45

ALL Muscles which serve for the same Motion, assist one another in the Action; and those Muscles which act opposite to them are call'd Antagonists; so that every bending Muscle has also an extending Muscle; and when the one contracts, its Antagonist extends. That Bone, or Bones, to which the Muscle is inserted, is the Part always that moves.

THE Head is lifted up, or pull'd backwards; mov'd semicircularly; and bended forwards.

IT is lifted up, or pull'd backwards, by four Pair of Muscles; the *Splenius*, the *Complexus*, the *Rectus Major*, and the *Rectus Minor*.

THE *Splenius* singly, without its Fellow, draws the Head together with the *Vertebra* of the Neck, to which it is inserted, to that side backwards; if they both act, they pull the Head directly backwards together, with those of the *Vertebra* of the Neck. This Muscle arises partly tendinous, and partly fleshy, from the four or five superior Spines of the *Vertebra* of the Back. The lower Part of this Muscle is inserted to the transverse Processes of the third, fourth, and fifth *Vertebra* of the Neck. The superior Part is inserted into the upper Part of the *Occiput*.

MR. COWPER observes, That Anatomists have err'd, in reck'ning the *Splenii* among the proper

46 Of the Muscles that move the Head.

proper Muscles of the Head, and is of Opinion, that they ought to be esteem'd as common to the Head and Neck, because they are also implanted to the transverse Processes of the *Vertebrae* of the Neck *.

THE Complexus is a Muscle also, that acting singly, draws the Head to the same side backwards, and both acting, draw it directly backwards.

Its Origination is from the transverse Processes of the *Vertebrae* of the *Thorax*, and is partly tendinous, and partly fleshy; it ascends obliquely, and becomes still more fleshy, adhering to the Spines of the *Vertebrae* of the Neck, is inserted into the *Os Occipitū*, immediately under the Termination of the *Splenius*. There is a Part of this Muscle inserted into the *Processus Mastoideus*, or the back-part of the Skull.

THE Rectus Major arises from the double Spine of the second *Vertebra* of the Neck, and is inserted into the lower part of the *Occiput*.

THE Rectus Minor lies under the *Rectus Major*, and is inserted into the *Os Occipitū*, and has its Origination from the back-part of the first *Vertebra* of the Neck. These Muscles also nod the Head backwards.

THE semicircular Motion of the Head is perform'd by the *Obliquus Inferior*, *Obliquus Superior*, and *Mastoidaeus*.

* *Cooper*, Tab. 16.

Of the Muscles that move the Head. 47

THE *Obliquus Inferior* arises from the double spinal Process of the second *Vertebra* of the Neck, and after an oblique Ascent is inserted into the transverse Process of the first.

WHEN either of these *Obliqui Inferiores* acts, it draws the transverse Process of the first *Vertebra* near the Spine of the second; so consequently the Head is mov'd to the same side, and is very much assisted on the contrary side by the *Mastoidæus*; and when they both act, they conspire to hold the Head more stable.

THE *Obliquus Superior*, arises from the transverse Process of the first *Vertebra* of the Neck, and is inserted into the lateral and inferior Part of the *Occiput*.

THO' these *Obliqui Superiores* perform the same Office with the *Recti Minores*, of pulling the Head directly backwards, when it is erect; yet as it is necessary the Head should be mov'd backward at the same Time it is turn'd to one side; it is an Argument of a considerable Council of Nature, to add these, and the *Recti Minores*, to act at that Time, since the *Recti Majores* are then so extended by that Rotation of the Head, that they cannot well act*.

THE *Mastoidæus* arises partly fleshy, and partly tendinous, from the upper Part of the *Sternum*, and near half the *Clavicula*, with

* Couper, Tab. 17.

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two, and sometimes three, distinct beginnings; and ascending obliquely, joyn in half their Progress, and compose a somewhat round, thick, and fleshy Muscle; and marching over the upper Part of the Muscle call'd *Elevator Scapulae*, becomes broader again; and is inserted tendinous into the back-part of the *Processus Mammillaris*; and the adjoining Part of the *Os Occipitis*, above the Insertion of part of the *Splenius*.

‘ THE Origine, Progress, and Insertion of
 ‘ this Muscle, not being duly consider’d, has
 ‘ led Anatomists into Errors concerning its
 ‘ Use; for if this Muscle acts on either side;
 ‘ the Mammillary Process, on the same side;
 ‘ is brought towards a right Position with its
 ‘ Original at the *Sternum*; and the Head is
 ‘ turn’d to the contrary side; and this Action
 ‘ of it is commonly well express’d by Painters;
 ‘ but should it more and more contract, it will
 ‘ draw the Head to one side forwards, as we
 ‘ see in wry Necks (commonly so call’d) where
 ‘ one of these Muscles remains contracted; but
 ‘ if they both act together, the Head is rather
 ‘ pull’d back than forwards, by how much
 ‘ their Insertions are rather behind the *Mam-*
 ‘ *millary Processes* than upon them; which
 ‘ Processes are *a Diametro* opposite to the Arti-
 ‘ culation of the Head, with the first *Vertebra*
 ‘ of the Neck *.

* *Cowper, Tab. 18.*

Of the Muscles that move the Neck. 49

THE Head is bended forwards by the *Rectus Internus Major*; and *Rectus Internus Minor*.

THE *Rectus Internus Major* arises partly fleshy, but chiefly tendinous, from the fore-part of the five interior transverse Processes of the *Vertebra* of the Neck, and is inserted into the foremost *Appendix* of the *Os Occipitis*, near its great Hole, that transmits the *Medulla Oblongata*.

THE *Rectus Internus Minor* lies on the fore-part of the first *Vertebra* of the Neck, like the *Rectus Minor* on the back-part; and is inserted into the anterior *Appendix* of the *Os Occipitis*, immediately under the former.

THESE are Antagonists to the *Recti Minores*.

FALLOPIUS takes Notice of another Pair of Muscles call'd *Recti Laterales*, which come from the transverse Processes of the first *Vertebra*, and are inserted near the Mammillary Process, and help to move the Head a little on one side.

THE Neck is bended by the *Longus* and the *Scalenus*.

THE *Longus* arises partly tendinous, but chiefly fleshy, from the fore-part of the five upper *Vertebra* of the Back; and is inserted into the fore-part of all the *Vertebra* of the Neck; because these *Vertebra* are more moveable than those of the Back.

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IT is call'd, for its Use, *Flexor Colli*, the Bender of the Neck.

THE *Scalenus* arises from the first and second Ribs, and ascending, is inserted into all the transverse Processes of the Neck, except the first; for which Reason, the Neck being more easily mov'd, than the Ribs to which they are fasten'd, these Muscles are justly reckoned among the Benders of the Neck.

THE Neck is extended by the *Musculi Vertebrales*, and is pull'd directly backwards by the *Spinalis Colli*.

THE *Spinalis Colli* arises fleshy from the five superior transverse Processes of the *Vertebra* of the Back, and inferior of the Neck; and ascending obliquely, is inserted into the inferior Margin of the back-part of the second *Vertebra* of the Neck: This, with its Fellow, pull the Neck directly backwards.

THE Body is kept erect by

THE *Longissimus Dors*; this Muscle is an inseparable Companion, at its Origination, with the *Sacrolumbus*, which arises from the back-part of the Spine of the *Os Ilium*; the upper part of the *Os Sacrum*; and all the Spines of the *Vertebra* of the Loins: In its Ascent it gives divers tendinous Insertions to the transverse Processes of the same *Vertebra*; as also to those of the Back and Neck. This Muscle is not only employ'd in keeping the Body erect, and bending it backwards, but it is a considerable Help in walking; for when either Leg

moves

The Muscles that move the Body. 51

moves forwards; this Muscle, on the same side, may be observ'd to be in Action near its Rise. Under this Muscle lies

THE *Transversalis Dorsi*, of which Anatomists commonly make three Muscles (*viz.*) the *Sacer*, the *Semispinctus*, and *Transversalis Colli*. It arises from all the transverse Processes of the *Vertebra* of the Loins, Back, and Neck; except the two first; and also from the Os *Sacrum*; and ascending obliquely, is inserted by so many distinct Tendons to the Spines of the superior *Vertebra*. This Muscle moves the whole Spine obliquely backwards.

THE *Inter Spinales* arise partly fleshy, and partly tendinous, from the Spines of the Loins; and the Inferior of the Back; and are inserted into the fifth, sixth, and seventh Spines of the Back: They joyn the *Longissimus Dorsi*; another Part arises from the superior Parts of each double spinal Process of the Neck; except that of the second *Vertebra*. (Mr. COWPER, who first observed these Muscles, takes Notice, That it was for these Muscles that the spinal Processes of the *Vertebra* of the Neck were made double) and it is inserted into the interior Parts of all the said Spines. This Muscle draws the spinal Processes nearer each other, when we pull the Head very much back.

THE *Quadratus Lumborum* arises fleshy from the posterior Part of the Spine of the *Ilium*; and after an oblique Ascent, is inserted

52 *The Muscles that move the Scapula.*

into the inside of all the transverse Processes of the *Vertebra* of the Loins. This Muscle moves the Body upon the Loins to one side, and moves the *Vertebra* of the Loins, or *Os Ilium*, nearer each other. So when we stand on one Foot, it draws the *Vertebra* to that side, and makes the Trunk come towards a perpendicular Direction of its Gravity to that Foot; so as to sustain the Weight of the whole Trunk, and superior Parts thereon. But if we hang by the Hands; then, either of these Muscles acting, draws the *Os Ilium* nearer the *Vertebra* of the Loins.

THE *Vertebra* of the Loins are bended by the Muscles of the lower Belly.

THE Muscles of the *Thorax*, being for the Use of Respiration, I shall omit, as well as those belonging to the Belly, Privities, &c. and shall proceed to those belonging to the Shoulder Blades, and then to those of the Limbs.

THE *Scapula* is mov'd backwards; and forwards; upwards; and downwards: It is moved forwards by

THE *Seratus minor Anticus*; is inserted into the *Processus Coracoides*, which it draws forwards; and arises thin and fleshy from the second, third, fourth, and fifth Ribs.

THE *Trapezius*, or *Cucullaris*, arises fleshy from the *Os Occipitis*, and tendinous from the Points of the Spines of the three lowest *Vertebra* of the Neck, and eight superior of the Back; which broad Origination is inserted into

The Muscles that move the Arm. 53

into the Spine of the *Scapula*; to the *Acromion*; and *Clavicula*. This Muscle moves the *Scapula* variously upwards, backwards, and downwards; according to the three Directions of its Fibres.

THE *Rhomboides*, so call'd from its Figure, arises tendinous from the two inferior Spines of the Neck, and four superior of the Back; growing fleshy in its oblique Descent, it is inserted to the whole Basis of the *Scapula*, which it draws upwards, and backwards.

THE *Levator Scapulae* has divers separate Originations from the second, fourth, and fifth, transverse Processes of the *Vertebra* of the Neck; which after unite and compose one large fleshy Muscle, which is inserted into the superior Angle of the *Scapula*, which it draws upwards. This Muscle is also call'd *Musculus patientia*, because those who are any ways griev'd, use it. These Muscles may move the Arm, as those of the Arm move it, because of the Connexion of the two Bones: They help also in Respiration.

WE now come to the Limbs themselves, and first of the Arm, which is, strictly speaking, only of that Part between the Shoulder Blade, and the Elbow.

THE *Humerus*, or Arm, has five different Motions; they move upwards; downwards; forwards; backwards; and round.

54 The Muscles that move the Arm.

T H E R E are three which lift the Arm upwards (*viz.*) the *Deltoides*; the *Supra Spinatus*; and *Coraco brachialis*.

T H E *Musculus Deltoides* is of a triangular Figure, and arises from the *Spina Scapula*; from the *Acromion*; and from the inferior external half of the *Clavicula*, where it is intirely fleshy; from hence descending, growing still narrower, it passes above the Joynt of the *Humerus*, and is inserted by a short Tendon, partly fleshy, and partly tendinous, to near the middle of the *Humerus* near its external side. This Muscfe does not only lift the Arm directly upwards, but also somewhat forwards, or backwards, according to the Direction of its different Series of Fibres.

T H E *Supra Spinatus* is plac'd above the Spine of the Shoulder Blade, and arises fleshy from all the Basis of the *Scapula* that's above the Spine; as also, from the Spine and superior Side of the Shoulder Blade, and from thence passing over the *Acromion*, and Articulation of the *Humerus*, where it becomes tendinous, is inserted into the Neck of the *Humerus*, which it embraces by its Tendon. This Muscle also moves the Arm a little backwards, as well as lifts it up.

T H E *Coraco brachialis*, arises partly fleshy, and partly tendinous, from the extreme Point of the *Processus Coracoides Scapula*; in its Descent it grows thicker; and is inserted into the middle, and inner part of the *Humerus*.

T H E

The Muscles that move the Arm. 55

THE Arm is drawn downwards by two Pair of Muscles, call'd the *Latissimus Dorsi*, and the *Teres Major*.

THE *Latissimus Dorsi*, or *Anis captor*. This Pair of Muscles covers almost all the Back; its Origination is thin, large, and tendinous, and deriv'd from the Spines of the seven lower *Vertebrae* of the Back; and from all the Spines of the *Vertebrae* of the Loins; from the superior Spines of the *Os Sacrum*; and also from the posterior Part of the Spine of the *Os Ilium*. In its Ascent over the Ribs laterally, it has divers *Fasciculi* of fleshy Fibres, that arise from thence, and joyn with it; and as it passes by the inferior Angle of the *Scapula*, it becomes thicker, more fleshy, and narrower, and is inserted with the *Teres Major*, with a short, flat, strong Tendon, into the *Humerus*. It draws the Arm downwards, and also a little backwards.

THE *Teres Major*, or *Rotundus Major*, arises from the lower Angle of the *Scapula*; it makes a broad, flat, but short Tendon; and is inserted with the *Latissimus Dorsi*, below the Neck of the *Humerus*. It draws the Arm backwards, and pulls it somewhat downwards.

THE Arm is mov'd forwards by the *Pectoralis*; which has a semicircular, broad, and fleshy beginning, from near half the inner part of the *Clavicula*, below from the *Os Stertoris*, and from all the cartilaginous Ends of

56 The Muscles that move the Arm.

the six superior Ribs; and from the bony part of the seventh Rib; and passing transversely over the upper part of the *Musculus Biceps Cubiti*, and above the Termination of the *Deltoides*, it is inserted by a short and broad, strong Tendon, into the upper and inner part of the *Humerus*.

THE crossing of the Fibres of this Muscle, near their Insertion, is a Contrivance in Nature, to render its Action more vigorous.

The Fibres of the upper part descend to the lower part of its Implantations to the *Humerus*; and those of its lower part ascend to the upper, crossing each other with acute Angles.

This Muscle is call'd also *Adductor Humeri*, and moves the Arm variously, according to the Operation of its several Series of Fibres. THE Arm is drawn backwards by three Muscles; the *Transversalis*; the *Infra Spinatus*; and *Subscapularis*.

THE *Transversalis*, or *Terax Minor*, arises from the lower Edge of the *Scapula*, and is inserted into the Neck of the *Humerus*. Mr. COWPER observes, That this Muscle may be wanting in some Bodies, and did imagine it to be so in a Subject he order'd a Figure to be drawn from.

THE *Infra Spinatus* lies below the Spine of the *Scapula*; and rises fleshy from the inferior Part of the Basis of the *Scapula*; and is inserted into the upper Part of the Neck of the *Humerus*.

THE

The Muscles that move the Cubit. 57

THE *Subscapularis* fills and covers all the internal concave Part of the *Scapula*; arises fleshy from its whole Basis, and from its upper and lower *Costa* internally, and grows less in its Progress; and passing over the Joynt, is inserted into the Neck of the *Humerus* in a semicircular manner. This Muscle draws the Arm to the Trunk of the Body; and is made use of by the Bag-piper, to compress his Bel- lows under his Arm.

THE Tendons of these three last Muscles surround the Joynt of the *Humerus*.

WHEN all these Muscles move successively, the Arm moves circularly.

THE *Cubitus*, which is that Part of the Arm (commonly so call'd) from the lower end of the *Humerus*, to the *Carpus*, or Wrist, is banded and extended by six Muscles: It is bent by the *Biceps*; and *Brachæus Internus*; and it is extended by the *Longus*; *Brevis*; *Brachæus Externus*; and the *Anconæus*.

THE *Biceps* has two Heads, or tendinous Originations; the one arises from the upper Part of the brink of the Head of the *Scapula*, under the broad Ligament of the Joynt, and is call'd the external Head, which is round and tendinous, and is inclos'd in the Channel in the Head of the *Humerus*. The other arises from the *Processus Coracoïdes*, and is call'd the internal Head; it is broad and tendinous; in their Descent they joyn; and about the middle, and fore-part of the Arm, they compose a large fleshy

58 The Muscles that move the Cubit.

fleshy Muscle, which becoming less near the Joynt of the Cubit, with the *Humerus*, grows perfectly tendinous, and is inserted by a short, thick, and round Tendon, into a Protuberance at the upper end of the *Radius*. Some of the Fibres of this Tendon form another thin Tendon, which passes over the *Musculus pronator Radii Rotundus*, and covers all the Muscles of the *Radius* and Fingers externally. This Muscle bends the Cubit.

THE *Brachius Internus* arises fleshy from the middle, and internal Part of the *Humerus*, at the Terminations of the *Deltoides*, and *Coraco Brachialis*; and lies partly under the *Biceps*, and descending over the Joynt of the Cubit, with the Arm-Bone, is inserted, partly fleshy, and partly tendinous, into the upper and fore-part of the *Cubitus*, by a very short, and strong Tendon. This Muscle bends the Cubit.

THE *Longus* arises from the inferior *Costa* of the *Scapula*, near its Neck; as it descends upon the back-side of the *Humerus*, it joyns the *Brevis*, which arises from the superior and hinder Part of the *Humerus*; and both together joyn the *Brachius Externus*, which arises from about the middle and hinder Part of the *Humerus*. The fleshy Fibres of these three being so joyn'd, and being externally tendinous, they cover the Elbow, and are inserted into the *Olecranium*.

THE

The Muscles that move the Radius. 59

THE *Anconeus* arises fleshy from the inferior and back-part of the *Humerus*; it is a small Muscle, but grows thicker as it marches between the upper ends of the *Ulna* and *Radius*, and is inserted into the lateral and internal Part of the *Ulna*, about a Thumb's length below the *Olecranium*.

THESE Muscles extend the Cubit.

THE *Radius*, or second Bone of the Cubit, is bended, and extended by the Muscles already describ'd in common with the *Cubitus*, or *Ulna*; yet it has peculiar to it self four Pair of Muscles; two of which turn the Palm of the Hand downwards, and are call'd *Pronator Teres*; or *Rotundus*; and *Pronator Quadratus*: The two other turn the Palm of the Hand upwards, and are call'd *Supinator Longus*; and *Supinator Brevis*.

THE *Pronator Teres* arises fleshy from the internal Protuberance of the *Humerus*; and passing obliquely, has a fleshy, and tendinous Insertion into the middle of the external Part of the *Radius*.

THE *Pronator Quadratus* arises broad, membranous, and fleshy, from the lower, and inner Part of the *Ulna*; and passing transversely over the Ligament that joyns the *Radius* to the *Ulna*, is implanted of the same breadth, on the external and lower Part of the *Radius*.

THE *Supinator Longus* arises fleshy from the external Ridge of the *Humerus*; it lies all along

60 *The Muscles that move the Wrist.*

along the *Radius*, to whose external, and inferior Part, it is implanted by a pretty broad Tendon.

THE *Supinator Brevis* arises tendinous from the external Protuberance of the *Humerus*; and from the external and upper Part of the *Ulna*; and passing round the *Radius*, adhering strictly to the Membrane that involves the Articulation of these two Bones, it is inserted into the upper, and fore-part of the *Radius*; but below the Tendon of the *Biceps*.

THE Actions of these Muscles are call'd Pronation, and Supination.

TWO Muscles belong to the Palm of the Hand.

THE *Palmaris* arises from the internal Extuberance of the *Humerus*; it expands it self into a large *Aponeurosis* which cleaves to the *Metacarpus*, and composes four Cases for the four Tendons of the Fingers to pass through.

THE *Palmaris Brevis* lies under the former, and arises from the Bone of the *Metacarpus* that sustains the little Finger; and is inserted into the eighth Bone of the *Carpus*. They assist the Hand in grasping any Thing, and this last makes the Palm of the Hand concave.

THE Wrist is compos'd of eight small Bones; and is bended, and extended, by four Pair of Muscles; two of which are internal, and two external.

THE

The Muscles that move the Wrist. 61

THE *Cubitus Internus* arises tendinous and fleshy from the internal Extuberance of the *Humerus*, and from the rough Edge of all the anterior Process of the *Ulna*, upon which it runs all along, firmly adhering to the *Pronator Teres* of the *Radius*; then passing under the annular Ligament, it is inserted by a flat, strong, and short Tendon, into the fourth of the first Order of the *Carpus*.

THE *Radius Internus* arises tendinous, from the same internal Extuberance of the *Humerus* as the former; and lying along the *Radius*, is inserted into the first Bone of the *Metacarpus* that sustains the Fore-finger.

THESE two Muscles bend the Wrist.

THE *Cubitus Externus* arises from the external Extuberance of the *Humerus*, and passing under the annular Ligament, is inserted into the fourth Bone of the *Metacarpus* that sustains the little Finger.

THE *Radius Externus* makes two distinct Muscles; the first arises broad, thin, and fleshy, from above the external Protuberance of the *Humerus*; and the second springs from the lowermost Part of the same Protuberance; they both lie on the out-side of the *Radius*, and passing under the annular Ligament, the one is inserted into the upper Part of the Bone of the *Metacarpus* that sustains the fore Finger, and the other into that which sustains the middle Finger, both being tendinous. They extend the Wrist.

THE

62 *The Muscles that move the Fingers.*

THE Fingers are bended, and extended, and drawn to and from the Thumb, by several Muscles.

THE Muscles bending the Fingers, are the *Sublimis*, and *Profundus*.

THE *Sublimis* arises from the internal Protuberance of the *Humerus*; and from the superior and anterior Part of the *Radius*: It divides into four Tendons, which passing under the annular Ligament, are inserted into the upper Part of the second Bone of each Finger. This bends the second Joynt of the Fingers. Each of these Tendons have a slit in the middle, through which pass the four Tendons of the *Profundus*; which lying under the *Sublimis*, arises fleshy from the upper Part of the *Ulna*, and divides into four Tendons, which pass first under the annular Ligament, and then through the slit of the former Tendons, and are inserted into the three Bones of the Fingers.

THE *Extensor Digitorum communis* arises from the external Protuberance of the *Humerus*; and divides at the *Carpus* into three flat Tendons, which passing under the annular Ligament, are inserted into all the Bones of the fore, middle, and ring Fingers.

THE *Lambricales* are four small Muscles rising from the Tendons of the *Profundus*, and inserted into the first Internodes of each Finger. They assist in bending the first Joynt of the Finger.

THE

The Muscles that move the Fingers. 63

THE *Interossei*, four of which call'd the Internal, arise from the upper Part of the *Metacarpus*, next the *Carpus*, and are inserted on the internal Sides of the first Bones of the Fingers, with the *Lumbricales*: These bring the Fingers to the Thumb. The other four are external, and arise from the upper Part of the Bones of the *Metacarpus*, next the *Carpus*; and are inserted on the external Sides of the first Bones of the Fingers; and these draw the Fingers from the Thumb.

THE Thumb is bended by two Muscles, call'd,

THE *Flexores Pollicis*; the first arises from the internal Extuberance of the *Humerus*, and from the middle and inner Part of the *Radius*; and passes under the annular Ligament, and is inserted into the third Bone of the Thumb. The second arises from the *Carpi*, and is inserted into the second Internode of the Thumb.

THE Thumb is extended by three Muscles (*viz.*)

THE *Extensor primi Internodei Pollicis* arises from the superior; and external Part of the *Ulna*; and is inserted near the second Joint of the Thumb. The *Extensor secundi* arises from the superior, and external Part of the *Radius*; and is inserted into the second Bone of the Thumb. The *Extensor tertii* arises from the *Ulna*, a little below the first, and is inserted into the third Bone of the Thumb.

THE

64 *The Muscles that move the Fingers.*

THE *Tenar* forms that Part call'd *Mons Luna*, and arises from the annular Ligament, and first Bone of the *Carpus*; and is inserted into the external Side of the Thumb, and draws it from the Fingers.

THE *Anti-tenar* arises from the Bone of the *Metacarpus* sustaining the fore Finger, and is inserted into the first Bone of the Thumb, and draws it to the Fingers.

THE *Abductor Indici* arises from the fore-part of the first Bone of the Thumb, and is inserted into the Bones of the fore Finger, and draws the Finger to the Thumb.

THE *Index* has a particular *Extensor* arising from the middle, and external Part of the *Ulna*; and passing under the annular Ligament, is inserted into the third Bone of the Finger.

THE little Finger has two proper Muscles.

THE *Hypotenar*; which arises from the fourth Bone of the second Rank of the Bones of the *Carpus*; and from the annular Ligament, and is inserted externally into the first Bone of the little Finger: This draws it from the other Fingers.

THE *Extensor* of the little Finger arises from the external Protuberance of the *Humerus*, and upper Part of the *Ulna*; and passing under the annular Ligament, is inserted into the third Bone of the little Finger.

THE Thigh, or *Os Femoris*, is bended, and extended; moved outwards; inwards; oblique-

The Muscles that move the Thigh. 65

obliquely ; and circularly ; by thirteen Pair of Muscles : it is bended by the *Psoas* ; *Iliacus* ; and *Pectineus*.

THE *Psoas Magnus* arises fleshy from the internal Side of the transverse Processes of the *Vertebrae* of the Loins, within the *Abdomen* ; and is inserted tendinous into the lower Part of the lesser *Trochanter*.

THIS bends the Thigh, by bringing it forwards.

THE *Iliacus* arises fleshy from all the internal Cavity of the *Os Ilium* ; it joyns the former where it begins to become tendinous ; and is inserted with it.

THIS bends the Thigh, and brings it directly forwards, as in walking.

THE *Pectineus* arises broad and fleshy from the external Part of the *Os Pubis* ; and is inserted into the Thigh-Bone, a little below the lesser *Trochanter*.

THIS bends the Thigh-Bone, by drawing it upwards.

THE Thigh is extended by the *Glutæus Major* ; *Medius* ; and *Minor*.

THE *Glutæus Major* arises fleshy from the *Os Coccygis* ; the Spines of the *Os Sacrum* ; and the posterior Part of the Spine of the *Os Ilium* ; it has also a tendinous beginning, at the external Margin of the Spine of the *Os Ilium* ; from whence marching over the external Part of the *Glutæus Medius*, at the great *Trochanter* ; it meets with the fleshy Part of the Muscle arising from the

F

poste-

66 *The Muscles that move the Thigh.*

posterior Part of the Spine of the *Os Ilium*; *Sacrum*; and *Os Coccygis*; and cleaving to a broad Ligament that runs between the *Sacrum*, and Tubercle of the *Os Ischium*; its fleshy Fibres descending disgregately, and almost semicircularly become tendinous, as they approach the great *Trochanter*; where it is united with its before-mention'd tendinous Origination, and descending together over the great *Trochanter*, joyn with the Tendon of the *Musculus Membranosus*, and is inserted by a large, thick, strong Tendon, to the *Linea Aspera*, on the Back of the Thigh-Bone, near four Fingers breadth below the great *Trochanter*.

THIS Muscle pulls the Thigh directly backwards.

THE *Gluteus Medius* arises fleshy from all the external Part of the Spine of the *Os Ilium*, under the former; and descending, becomes thicker and more fleshy; and is inserted semicircularly by a short strong Tendon to the superior, and external Part of the great *Trochanter*.

THIS Muscle assists the former.

THE *Gluteus Minor* arises with a semicircular, broad beginning, from the lower Part of the external side of the *Os Ilium*; from whence its fleshy Fibres descend, and are inserted partly fleshy, and partly tendinous, at the superior Part of the great *Trochanter*; this performs the same Office with the two former.

THE

The Muscles that move the Thigh. 67

THE Thigh is mov'd inwards, or both Thighs brought together by the *Triceps*; which having three Originations, and three Insertions, may be divided into three Muscles.

THE first arises by a strong roundish Tendon, from the inferior Part of the *Os Pubis*, next the *Pectineus*; and descending obliquely, joyns with the third, and is inserted above the second, into the *Linea Aspera* of the Thigh-Bone.

THE second arises from the lower Part of the *Os Pubis*, by a broad tendinous, but chiefly fleshy beginning; and is inserted about the middle of the *Linea Aspera* of the Thigh-Bone.

THE third arises broad and fleshy from the inferior Edges, and external Parts of the *Os Ischium*, and *Os Pubis*; and descending obliquely, is inserted partly tendinous, and partly fleshy, to the *Linea Aspera* of the Thigh-Bone. The lower Part of this Head is inserted a little below the second, to the internal and lower *Apophysis* of the Thigh-Bone. The Use of these three Muscles is various, according to the Diversity of its beginnings; so the last describ'd Part of it draws the Thigh-Bone upwards, inwards, and somewhat backwards; and the first and second beginnings, pull the Thigh more inward, and turn it somewhat outwards; as when we put our Legs a-cross each other.

68 *The Muscles that move the Thigh.*

THE Thigh is turn'd outwards by the *Quadragemini*; which are four Pair of Muscles.

THE first is call'd *Pyriformis*; by some, *Iliacus Externus*; and by others, *Quadregeminus Primus*; it arises round and fleshy from the inferior and lateral Part of the *Os Sacrum*; descending from thence obliquely in the great *Sinus* of the *Os Ilium*, above the acute Process of the *Ischium*; it joyns the *Gluteus Medius* before its Insertion with the

SECOND and third, call'd *Gemini*, which two Muscles are united by a carnous Membrane both above and below; and arise from the Protuberance of the *Ischium*; and are, with the first, inserted in the upper Part of the Dent, at the Root of the great *Trochanter*.

THE fourth is the *Quadratus*, which arises broad and fleshy, from the *Epiphysis* of the *Ischium*; and passes transversly of an equal breadth and thickness to its partly fleshy, and partly tendinous Implantation, at the out-side of the great *Trochanter*. These move the Thigh outwards, and somewhat upwards.

THE Thigh is mov'd circularly, and obliquely, when these Muscles act successively; but particularly by the two *Obturatores*.

THE *Obturator Internus* arises broad and fleshy, from the internal Circumference of the Hole that is between the *Ischium*, and *Pubis*; whence passing transversly, it is inflected on the *Sinus* of the *Ischium*; on each side of which,

The Muscles that move the Leg. 69

which, namely the acute, and obtuse Process, arises its second fleshy Body, call'd *Marsupium*, which, covering the original Tendons, descends obliquely with them, and are inserted into the Dent of the great *Trochanter*. Its Tendon lies between the *Gemini*; and by it the Thigh is turn'd outwards.

THE *Obturator Externus* arises fleshy from the external Circumference of the same Hole, as the former; its Name is derived from its Situation; and from its Use it is call'd *Rotator Femoris Extrorsum*; it embraces the Neck of the Thigh-Bone, and passing under the *Quadratus*, lessens it self, and is implanted tendinous to the small Cavity of the great *Trochanter*.

THE Leg is bended by four Pair of Muscles; and extended by four; those that bend the Leg, are, the *Semi-nervosus*; the *Semi-membranosus*; the *Biceps Femoris*; and the *Gracilis*.

THE *Semi-nervosus* arises fleshy from the back-part of the Protuberance of the *Ischium*; and is inserted, by a flattish, round Tendon, into the internal Part of the *Epiphysis* of the *Tibia*.

THIS bends the Leg backwards, and brings it a little upwards.

THE *Semi-membranosus* has a tendinous Origine from the Protuberance of the *Ischium*, and is partly cover'd with the *Semi-nervosus*, in its proper Situation; it composes a broad, flat Tendon, which becomes a round, fleshy

70 *The Muscles that move the Leg.*

Belly, on the back-part of the Thigh: About the lower *Epiphysis* of the Thigh-Bone it is converted to a strong round Tendon; and is inserted into the upper, and back-part of the *Tibia*.

THIS bends the *Tibia*; and more particularly its lower Tendons; which, as they run in a Channel on the inferior *Epiphysis* of the Thigh-Bone, as in a Pulley, they there direct, and render its Action of bending the Leg more vigorous.

THE *Biceps Femoris*, so call'd from its two Heads; one of which arises tendinous and fleshy, in common with the *Semi-nervosus*, from the Protuberance of the *Ischium*; the other arises from the middle of the *Linea Aspera* by a fleshy acute beginning, which, as it descends, grows broader, and joining the other, is inserted by one Tendon into the upper, and external Part of the *Tibula*.

THIS Muscle also bends the Leg.

THE *Gracilis* arises somewhat broad, partly tendinous, and partly fleshy, from the Union of the *Os Pubis*, and *Ischium*; and in its strait Descent, by the in-side of the Thigh, it becomes tendinous, and is so inserted into the superior, and internal side of the *Tibia*.

IT assists the Flexors of the *Tibia*.

THE Leg is extended by four Pair of Muscles, which are, the *Rectus*; the *Vastus Emernus*; the *Vastus Internus*; and *Crureus*.

TH E

The Muscles that move the Leg. 71

THE *Rectus* arises fleshy from the Pro-em-nence of the lower Part of the Spine of the Os *Ilium*, a little above the *Acetabulum*; and descends directly between the two following, the *Vastus Externus*; and *Vastus Internus*; and over the *Crureus*; and becoming tendinous four Fin-gers breadth above the *Patella*, or *Knee-Pan*, unites with the Tendons of the two *Vasti*, and *Crureus*, and is inserted with them into the *Tibia*.

THE *Vastus Externus* arises externally ten-dinous, internally fleshy, from the lower Part of the great *Trochanter*, and exterior Part of the *Linea Aspera* of the Thigh-Bone; whence descending it becomes intirely tendinous; and joyning the Tendons of the *Rectus*, and *Vastus Internus*; is inserted with them (after joyning with the *Patella*) to the *Tibia*.

THE *Vastus Internus* arises partly tendi-nous, and partly fleshy, at the *Linea Aspera* of the Thigh-Bone; at the Root of the lesser *Trochanter*, whence descending obliquely, and almost semicircular, it becomes tendinous, and joyns with the Tendons of the two foregoing Muscles, and the *Crureus*; and joyning the *Patella*, it is inserted with them.

THE *Crureus* arises fleshy and large, on the fore-part of the Thigh-Bone, between the greater and lesser *Trochanter*; it descends di-rectly, and becomes intirely tendinous a little below the upper Part of the Tendon of the *Rectus*; it lies close upon the Bone, and joyning

72 *The Muscles that move the Leg.*

ing with the three foregoing Muscles, they altogether make one broad Tendon, and fixing to the *Patella*, is afterward implanted on the little Proeminence on the upper, and fore-part of the *Tibia*.

THESE extend the Leg, and these extending Muscles of the *Tibia* are much stronger than their Antagonists the *Flexors*, as appears by their Magnitude and Conformation.

MR. COWPER observes, ' That this is
' not without some considerable End design'd
' by the Author of Nature; for should not
' the Legs (says he) be extended with a
' Force superior to the incumbent Weight,
' we should be continually liable to an Inflexi-
' on at the Knees, through the Pressure of the
' whole Body; much less should we be able to
' translate the Body from one Place to another;
' but the All-wise Architect of Human Bodies
' has so fram'd these Muscles, as not only to
' make them useful in supporting the whole
' Body, and rend'ring them effectually ser-
' viceable in Walking, Running, and the like:
' But thro' the great Proportion of Strength of
' these extending Muscles of the *Tibia*; they
' are also capable (upon Inflexion at the
' Knees) by their sudden acting, to extend
' the Legs with such a Force, as to remove the
' whole from the Place where it stood, as in
' Leaping: In which Action the *Sacrolumbales Longissimi Dorsi*, &c. (and the *Gasterocnemii* of the Feet do in like manner) concur
' in extending these Parts.

THE

The Muscles that move the Leg. 73

THE Leg is mov'd obliquely by three Pair of Muscles, the *Sartorius*, the *Popliteus*, and the *Membranofus*.

THE *Sartorius* arises sharp and fleshy from the inferior Part of the Spine of the *Ilium*, close by the *Musculus Communis* of the *Membranofus*; and descending obliquely by the inside of the Thigh, it becomes tendinous, and is inserted three or four Fingers breadth below the superior Extremity, into the internal side of the *Tibia*.

By this Muscle the Leg is mov'd up, and somewhat forwards and inwards; in which Actions the upper Part of this Muscle appears through the Skin; and by this Muscle we throw one Leg and Thigh cross another, or sit like Taylors, from whom this Muscle has deriv'd its Name.

THE *Popliteus* arises with a short, strong Tendon, from the external and inferior Protuberance of the Thigh-Bone; which descending obliquely over the Joynt, it becomes fleshy, and expands it self more and more, till it is implanted to the superior, and internal Part of the *Tibia*. This Muscle not only assists in bending the Leg; but is so situated, as to antagonize the *Biceps Femoris*, when the Leg, or Knee, is bended, in turning the Foot and Toes inwards.

THE *Membranofus*, or *Fascia lata* (so call'd from its membranous Expansion, comprehending all the Muscles of the *Tibia*, with
part

74 *The Muscles that move the Foot.*

part of those of the Thigh ;) arises fleshy and acute, from the fore-part of the Spine of the *Ilium*; descending obliquely, it becomes tendinous four Fingers breadth below the great *Trochanter*; whence it descends directly over the *Vastus Externus*, to its proper Termination at the upper Appendix of the *Fibula*. When this Muscle acts, it draws the Leg a little outwards, and helps in extending the Leg.

THE Foot is bended by the *Tibialis* and *Peroneus Anticus*.

THE *Tibialis Anticus* arises fleshy from the upper and fore-part of the *Tibia*, between its Proeminence, where the great Tendon of all the extending Muscles of the Leg is inserted; and descending obliquely over the inferior Part of the *Tibia*, and under the annular Ligament; it is inserted by a strong, and somewhat round Tendon, into the *Os Cunei forme*, which answers to the great Toe.

IT pulls the Foot upwards, and forwards directly.

THE *Peroneus Anticus* is the longest Muscle plac'd on the *Fibula*; it arises externally tendinous, and internally fleshy, from the upper, and fore-part of the *Fibula*; and descending, it composes a strong flat Tendon, which becomes somewhat round, as it runs thro' the Channel which is in the external Ankle; and it joyns the *Peroneus Posticus* to its Insertion; and is it self implanted at the superior, and hinder Part of the *Os Metatarsi* of the great Toe,

THE

The Muscles that move the Foot. 75

THE Foot is extended by four Muscles; the two *Gastrocnemii*; the *Soleus*; and the *Plantaris*.

THE two *Gastrocnemii*, with the *Soleus*, make the Calf of the Leg. One arises from the back-part of the internal Protuberance of the Thigh Bone; the other springs from the same Part of the external Protuberance of the same Bone: A little below the Joynt their fleshy Bellies unite, and make one Tendon with the following, which is inserted into the *Os Calcis*.

THE *Soleus*, which lies under the former, arises partly tendinous, but chiefly fleshy, from the upper, and back-part of the *Fibula*; and *Tibia*; descending it joyns its Tendons with the former, and are inserted, as before. The Tendon compos'd of these three Muscles is big and strong, and call'd *Tendo Achillis*.

* WHEN these foregoing Muscles act, the Foot is said to be extended, or pull'd backwards, which Motion of it is very necessary in Walking, Running, Leaping, and standing on Tip-toe, &c. hence it is those that walk much have those Muscles larger than others, thro' the frequent Use of them, and amongst whom, those that carry heavy Burthens, and especially Chairmen; and those who wear Pumps, or low Heel Shoes, have

* *Couper*, Tab. 33.

36 *The Muscles that move the Foot.*

these Muscles not only remarkably larger than others, but the Calf of the Leg is sunk considerably lower.

THE *Plantaris* arises fleshy from the superior back-part of the external Head of the Thigh-Bone; and descending obliquely, it composes a thin, long, flat Tendon, which marches over the *Os Calcis*, expands it self into a large *Aponeurosis* on the Sole of the Foot, and has the same Use, Situation, and Connexion, as that of the Palm of the Hand.

THE Office of this Muscle is very obscure.

THE Foot is mov'd side-ways by two Pair of Muscles; the *Tibialis Posticus*; and the *Peroneus Posticus*.

THE *Tibialis Posticus* arises partly fleshy, and partly tendinous, at the superior and back-part of the *Fibula*; and *Tibia*; descending it becomes tendinous, and passes through the Fissure of the inner Ankle; and is inserted to the *Os Naviculare*.

THIS draws the Foot upwards, and inwards.

THE *Peroneus Posticus* arises acute and fleshy from the superior, and external Part of the *Fibula*; and descending passes through the Fissure of the external Ankle under the Sole of the Foot; and is inserted into the *Os Metatarsus* that sustains the little Toe.

THIS pulls the Foot outwards.

THE four lesser Toes bend, extend, and move side-ways.

THEY

The Muscles that move the Toes. 77

THEY are bended by two Pair of Muscles, (*viz.*) the *Perforans* ; and *Perforatus*.

THE *Perforans* arises from the superior, and back-part of the *Tibia* ; and passing first under the annular Ligament, divides into four Tendons, which pass through the Holes of the *Perforatus* ; and are inserted into the third Bone of each Toe.

THE *Perforatus* arises from the inner, and inferior Part of the *Os Calcis* ; and divides into four Tendons ; is inserted into the second Row of each Toe.

THESE Tendons (as was before observ'd) being perforated, the Tendons of the *Perforans* pass thro' them.

THESE Muscles bend the four lesser Toes.

THE Toes are extended by the *Longus* ; and the *Brevis*.

THE *Longus* arises from the upper, and outer Part of the *Tibia* ; and from the upper Part of the *Fibula*, and divides into five Tendons ; and passing under the *Ligamentum Annulare*, are inserted into the third Bones of the four lesser Toes, and into the *Os Metatarsi*, that sustains the little Toe.

THE *Brevis* lies under the former, and arises from the external, and anterior Part of the *Os Calcis* ; and is inserted by five Tendons, into the second *Phalanx* of all the Toes.

THESE Tendons cut the Tendons of the former at acute Angles.

FROM

78 *The Muscles that move the Toes.*

FROM the four Tendons of the *Perforans* arise the *Lumbricales*, which are inserted into the inside of the four lesser Toes.

THE *Interossei* are Eight; four *Externi*, or External; and four *Interni*, or Internal; and lie between the Bones of the *Metatarsi*.

THE *Interni*, which draw the Toes to the great Toe, lie towards the Sole of the Foot; and arising from the superior Part of the Bones of the *Metatarsi*; are inserted with the *Lumbricales*, into the inside of the first Bones of the lesser Toes. The *Externi*, which draw the Toes from the great Toe, lie on the top of the Foot; they rise from the superior Part of the Bones of the *Metatarsi*, next the *Tarsus*; and are inserted on the outer sides of the first Bones of the Toes.

THE *Abductor minimi digiti* rises from the external Part of the *Os Calcis*; and is inserted into the superior Part of the first Bone of the same Toe externally.

THE great Toe is bended; extended; and mov'd side-ways.

THE *Flexor Pollicis Longus* rises from the superior, and back-part of the *Fibula*; and passing behind the inner Ankle; is inserted into the last Bone of the great Toe.

THE *Flexor Pollicis Brevis* arises from the middle *Os Cuneiforme*; and is inserted into the second Joynt of the great Toe.

THE

The Muscles that move the Toes. 79

THE *Extensor Pollicis* arises from near the middle of the anterior Part of the *Fibula*; and passing under the annular Ligament, is inserted into the last Bone of the great Toe.

THE *Tenar*, or *Abducens Pollicis*, arises from the *Os Calcis*; and from the largest *Cuneiforme*; and is inserted into the external side of the *Os Sesamoides*.

IT draws the great Toe from the rest.

THE *Anti Tenar*, or *Adductor Pollicis*, arises from the inferior Part of the third *Os Cuneiforme*; and is inserted into the inside of the *Ossa Seseamoides*.

IT draws the great Toe to the rest.

THE *Transversalis* comes from the Bones of the *Metatarsus*, that sustains the Toe next the little Toe; and is inserted, crossing the other Bones into the *Os Seseamoides* of the great Toe.

THIS brings all the Toes close to one another.

WE shall conclude with an Observation of Mr. Cowper's.

THE *Talus* (says he) or Heel, together with the Toes, being, as it were, a Leaver to the whole Body; ought therefore to be attended with Muscles of great Strength to extend them; wherefore we find those Muscles so much to exceed their Antagonist the *Tibialis Anticus*; as well in the advantageous Constructure of their differing Series of fleshy Fibres, as their Magnitude, and In-

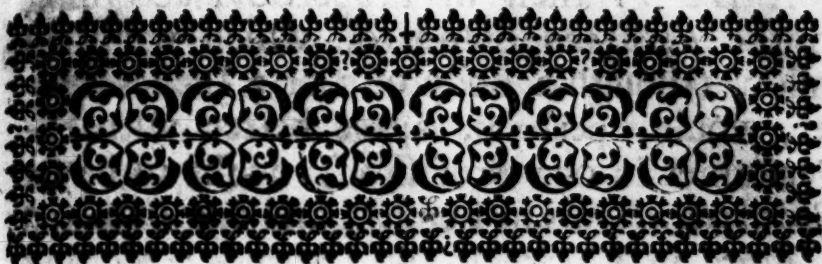
80 *The Muscles that move the Toes.*

- Insertion, at the Extremity of the *Os Calcis*;
- by which they are not only render'd service-
- able in Walking, Running, and the like ; but
- do also support the *Tibia* in standing ; least
- the Weight of the Body should make them
- incline forwards at their Articulations with
- the Bones of the Feet.



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PROPORTION.

THOUGH we have given you already a Description of the external Parts of Human Body, yet we believe it to be no less necessary at this Time, to take another View of the Figure of Human Body, as it relates to the due Proportion of each Part, and the Difference arising betwixt them, in Reference to Age, Sex, &c.

THE Body, as we observ'd before, being a Composition of several Figures of its external Parts, 'tis requisite we should explain the Proportion of a Human Body, according to the absolute Rules of Nature; that we may have before us a Standard to measure all the rest, and to determine what Body is to be call'd Tall; what Short; Slender; or Thick; Broad; Strait; Well-proportion'd; or Ill-shap'd.

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A BODY then in Proportion, according to the *European* Standard, which we shall follow (though a Body of 2 or 3 Inches shorter, would, perhaps, agree better with the Performer in our Profession) ought to be six *Geometrical* Feet in Length; and one Foot and a Third in Thickness and Latitude: Not but that Bodies which do not recede far from this Rule, may, notwithstanding, be included within the Catalogue of well proportion'd Persons.

Thus (according to this Standard) he must be called Tall, who measures seven Feet, or little less in Height, though well-proportion'd as to Shape; and so, on the contrary, he is to be call'd a little Man, who measures but five Feet, or little more, though in his other Dimensions proportionate, and his Body well-shap'd. Those are called Thick, or Fat Men, who measure round the Breast, or Belly, above three Feet; for in a well-proportion'd Body, the Thickness is just half the measure of the Length; so those who do not come near the half of their Length in Circumference, are call'd Lean.

THESE Rules concerning Magnitude are to shew, how it is most commonly observ'd in Human Body; for after all, there is still a great Inequality among our Bodies, depending on the different Ages, Sex, &c.

As to Age, it is obvious, that there is a considerable Diversity betwixt the Shape of a Boy,

Of PROPORTION. 83

Boy, a young Man, and a Person come to full Growth and Maturity. As for Infants, and old Men, I shall say nothing to them, as not coming under the Rules of this Art.

A Boy, or Child, is little and short; a Youth somewhat bigger, or taller; but a young Man arriv'd to his full Growth, or Maturity, is then only proportionable in all his Parts. There is also a Difference observable in reference to Sexes; for not only the Symmetry or Proportion of the Woman differs from that of a Man; in that the Shoulders are remarkably narrower, and that the Channel, or Collar Bones, and Muscles in general, do not appear so strong in them, as in Men; but also, that the Woman in general is not (or rather ought not to be) so big as the Man; tho' in other Animals, the Female is generally bigger than the Male.

BEFORE I come to a closer Examination of the Parts in particular, I must beg leave to say a Word or Two of the Skin, as it is the first, and outermost Covering of the Body, and is call'd the *Cuticula*, or Scarf-skin. If we examine this Skin with a Microscope, it appears compos'd of several Lays, or Beds, of exceeding small Scales, sticking close to the papillary Surface of the Skin; and so intangle with each other, that they appear a continued Membrane, when rais'd from the true Skin by Blisters, upon Burning, or Application of blistering Plaisters.

LEWENHOCK reckons, That in one cuticular Scale there may be five Hundred excretory Channels; and, that a Grain of Sand will cover two Hundred and Fifty Scales; so that one Grain of Sand will cover one Hundred twenty five Thousand Orifices, thro' which we daily expire. The Use of this Scarf-skin is to defend the Nerves of the Skin (which are the Origin of the Sense of Feeling) from the Injuries of rough and hard Bodies, as well as from the Air.

NOW we shall consider the Parts in particular, as to Figure, and Magnitude; and what Proportion they bear to one another; and will begin with the Head.

THE Head ought to be of an oblong, spherical Figure, according to its natural Conformation; yet somewhat flattish on both sides, near the Temples: Its true Magnitude lengthways, ought to make up the sixth Part of the whole Body, measuring from the lower Extremity of the Chin, to the Crown of the Head.

THE Neck, according to its natural Figure, ought to be round; but it is not every way of the same Length; for in its fore-part, from the Chin to the *Jugulum*, it ought to be four Geometrical Inches long; but its hind-part, from the Extremity of the hind-head, to the first *Vertebra*, three Inches; on the lateral Parts, or Sides, from the tip of the Ear, to the upper Part of the Shoulder, about seven Inches:

Of PROPORTION. 85

Inches: The Breadth, or Diameter of the Neck, is four Inches; its Circumference twelve.

THE *Thorax* is of an oval Figure, being straiter on its upper Part, where it is conjoyn'd with the Neck, and broader in its inferior Part, where it is adjoining to the lowermost *Venter*. On the Breast before, and on the Back behind, it is somewhat flatter. Its natural Proportion is thus computed: The Breast, or Chest, which begins at the *Jugulum*, or Cavity of the Neck, and terminates at the *Cartilago Ensiformis*, is call'd the *Sternum*, and contains eight Inches. The Back, from the first *Vertebra* of the *Thorax*, to the Extremity of the Twelfth, or beginning of the Loins, a Foot and an Inch; so that the Breast is five Inches shorter than the Back. The Sides are measur'd from the *Clavicula* to the Extremity of the *Thorax*, where the spurious Ribs end, nine Inches and an half. The *Thorax* is contracted about the Breadth of an Inch in Expiration, and is dilated two in Inspiration. This is the natural Proportion of the *Thorax*, which is nevertheless subject to various Alterations, either by Nature, or internal Causes; or else by Art, or external Injuries.

THE Breasts are different, according to the Sex. In Men they do not rise very high; but in Women they swell to a roundish Figure. In Virgins of eleven or twelve there is scarce any Thing appears, except the Nipples;

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but they increase as they advance in Years.

THE *Venter*, or Belly, in its natural Proportion, ought to have the Navel for its Center; its Diameter, from the Navel to the Back, about nine or ten Inches.

THE Hands and Feet bear so near a Proportion to one another, that those who have long Legs, have also long Arms, in a well-proportion'd Body: The whole Leg, in such a Body, will contain about three Feet, if the Body be six Feet in length. The Hands and Feet then being of an equal length, measure thus: The Length, from the Os *Pubis* to the Heel, will be the same with that which is taken from the Arm-pit to the Extremity of the middle Finger.

MR. DU FRESNOY, in his Observations on the Art of Painting, where he speaks of the Justness of Proportion, and of the Harmony they make with one another, gives us the following Measures of a Human Body.

THE Antients (says he) have commonly allow'd eight Heads to their Figures, though some of them have but seven. But we ordinarily divide the Figures into ten Faces (that is to say) from the Crown of the Head to the Sole of the Foot, in the following Manner.

FROM the Crown of the Head to the Fore-head, is the third Part of a Face.

THE Face begins at the Root of the lowest Hairs which are upon the Fore-head, and

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and ends at the bottom of the Chin.

THE Face is divided into three proportionable Parts; the first contains the Fore-head; the second the Nose; and the third the Mouth and the Chin.

FROM the Chin to the Pit betwixt the Collar Bones, are two Lengths of a Nose.

FROM the Pit betwixt the Collar Bones, to the bottom of the Breast, one Face.

FROM the bottom of the Breast to the Navel, one Face.

FROM the Navel to the Genitories, one Face.

FROM the Genitories to the upper Part of the Knee, two Faces.

THE Knee contains half a Face.

FROM the lower Part of the Knee to the Ankle, two Faces.

FROM the Ankle to the Sole of the Foot, half a Face.

A MAN, when his Arms are stretch'd out, is from the longest Finger of his right Hand, to the longest of his left, as Broad as he is long.

FROM one side of the Breasts to the other, two Faces.

THE *Humerus*, or Arm-Bone, is the Length of two Faces, from the Shoulder to the Elbow.

FROM the end of the Elbow to the Root of the little Finger (*viz.*) the *Cubitus*, *Carpus*, and *Metacarpus*, contain two Faces.

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‘ FROM the Socket of the Shoulder Blade,
‘ to the Pit betwixt the Collar Bones, one
‘ Face.

‘ IF you would be satisfied in the Mea-
‘ sures of Breadth, from the Extremity of one
‘ Finger to the other, so that this Breadth
‘ should be equal to the Length of the Body,
‘ you must observe, That the Articulations of
‘ the *Cubitus* and the *Humerus*, and of the
‘ *Humerus* and *Scapula*, bear the Proportion
‘ of half a Face when the Arms are stretch’d
‘ out.

‘ THE Sole of the Foot is the sixth Part
‘ of the Figure.

‘ THE Hand is the Length of a Face.

‘ THE Thumb contains a Nose.

‘ THE inside of the Arm, from the Place
‘ where the Muscle disappears, which makes
‘ the Breast (call’d the *pectoral* Muscle) to
‘ the middle of the Arm, four Noses.

‘ FROM the middle of the Arm to the be-
‘ ginning of the Hand, five Noses.

‘ THE longest Toe is a Nose long.

‘ THE two utmost Parts of the Teats,
‘ and the Pit betwixt the Collar Bones of a
‘ Woman, an equilateral Triangle.



O F

Defects; Ill Habits, &c.



FROM the Symmetry, and Harmony of all the Parts of a Body, of a regular Proportion, *Beauty* arises.

FROM a just Position, Disposition, and Contrast of such proportionate Parts, *Grace* arises.

THERE is a great Difference betwixt Beauty, and Grace; for a Body may be regular, and beautiful in all its Parts, and yet not agreeable to the Eye; for Beauty (as *Galen* says) is] nothing else but a just Accord, and mutual Harmony of the Members, animated by a healthful Constitution. How much then ought the Art of Dancing to be valu'd, which, by a just Disposition, and by an harmonious Motion of all the Parts, adds Gracefulness to this just Accord, or Symmetry of the Mem-

90 *Of Defects; Ill Habits, &c.*

Members; and, at the same Time, by the Exercise arising from it, contributes so much to the preserving of Health? For from a true Knowledge of our Art, Rules are ascribed for a right Placing, and Situation of the Head; for the Flexion, and Extension, or Turn of the Neck; by which an Air imparts it self throughout; and adds to the Beauty of the Face. A regular and natural Carriage of the Body; a just Position of the Feet in Standing; with an unconstrain'd, contrasted Motion in Walking, gives Gracefulness to the Shape: Rules for which will be endeavour'd to be laid down in the following Lecture.

As we have consider'd the Body in its due Proportion, Beauty, and Grace, it may not be less agreeable to us, to set it in a contrary View, and make some few Observations upon it in Relation to its Defects; and endeavour to offer some Rules, and Remedies for the Prevention, or Correcting of them.

THE Defects which happen to the Human Body, through the Mis-formation of the Parts, are many, and of various Kinds, which are either natural; or contracted by ill Habits; of the first Sort, are Crookedness in the Spine, or Back; Luxations of Hip, Knee, or Ankle; and Inversion of the Toes, even so far as they shall be turn'd almost in the Place, or natural Position of the Heel; and these are very difficult to correct; and much more to cure; though it hath been my Happiness to be acquainted

Of Defects; Ill Habits, &c. 91

quainted with two ingenious Artists; Mr. *Presgrave* *, and Mr. *Johnson* †, who do, and have done Wonders this Way; the former by his excellent Bandage; and the latter by his artful Instruments; and both by long Experience, and skillful Hands.

ANOTHER Defect in Nature, which I cannot omit, is a Distortion of the *Vertebrae* of the Neck, and which is call'd a wry Neck; but this often happens to Infants, through a Neglect, or Ignorance of the Nurses; by which Means the *Muscles* moving the Head and Neck, are either too tightly contracted, or too much relax'd, whence they become wry neck'd; and a small matter of either of these, by a long ill Habit, gives to Children a Stiffness in that Part, which is seldom or never corrected, except begun withal very young, which should be a great Inducement to Parents, to let their Children learn this Art of Dancing betimes, in order to correct and cure all ill Habits, that may become irremediable in length of Time; for 'tis certain, that the more firm Parts, in Infancy are flexible, and capable of being moulded into any Form.

THERE are several other ill Habits of the Body which are much more easy to correct; as the twisting of the Ankles; which if

* In Charles Street, Westminster.

† In Little Britain.

there

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there be no Dislocation, is reliev'd by good strengthening, or discutient Plaisters. The turning in the Toes, we find by our own Experience, not only help'd, but intirely corrected by Position, and Practice. That Misformation of knocking the Knees together, through a Weakness in the Tendons, is often cur'd in Youth by Exercise; and especially, if assisted by proper external Application; but in Adults this Defect is seldom or never to be redress'd.

MOREOVER, I beg leave to observe, in relation to ill Habits; that Negligence; and the Custom of our Country, often occasions, not only Deformity, but even Death it self; and these proceed from the manner of Swathing our Infants; which, except a particular and tender Care be taken, such Swathing presses and draws in the *Sternum*, and Ribs, and so confines the Breast, as to produce in Infancy, Consumptions, and Shortness of Breathing; and in riper Years, *Asthma's*, *Phthysicks*, and *Cathars*, &c. Nor do these Nurses take that due Care of the turning of the Limbs, which generally occasion that ill Position of the Knees and Feet; tho' these (as I have observ'd before) are easily rectify'd by us in our Profession, provided they be taken while the Subject is young.

OTHER ill Habits are contracted, either by working in Imbroidery, or such like Works as are done in Tents; and generally practis'd
in

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in our Boarding-Schools; this often occasions Wryness, if not prevented by a careful Instruction of the Scholar to work alike with both Hands; so that one Hand may be sometimes above the Work, and sometimes the same Hand below the Work. I would also recommend to all who have Youth under their Care, to take particular Care, that the Body do not lean, or incline to one side more than the other, but that it be upright, and even; and rested alternately on the Feet; that the Carriage, or Motion, of the Arms and Hands, be without Constraint; and this will not only prevent Wryness of the Body, but give a Freeness to the Limbs, which will add considerably to the Beauty and Grace of every Action; and by this Means the Address of such Persons will always be agreeable and easy.

BUT when such Wryness of the Neck, or Body is contracted by such, or any other ill Habits, it behoves the Master, first to endeavour to find out the Occasion of such Defect; how long contracted; and what Part affected; and then let him proceed to the Remedy; in doing of which, let him not be too hasty, nor wanting in Diligence, and constant Application.

As some Defects arise from the Bone, which are either natural, as Bandy Legs, &c. or accidental, as from the ill Setting of a broken Bone, and the like; and other Defects, are caus'd by a too great Contraction, or Relaxation

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laxation of the Muscles, or Ligaments: It is, without Dispute, of great Consequence to us (who are Masters in the Art of *Dancing*) to instruct our selves in some little Knowledge of Anatomy, whereby, at least, by knowing the Cause of such Defects, we may be able to judge whether they be curable or not; for, if incurable, we shall spare our selves a great deal of unnecessary Trouble, and turn our Endeavours to cover such Defects, by an artful Disposition of the other Parts opposite, or antagonist, to them: But if remediable, such Knowledge will not a little contribute towards removing such Defects.

THERE still remain some other Defects, though of a lesser Degree, and which I shall only mention to you, and these come directly under our Care, and are obvious to the meanest of our Profession (though by them very seldom rectify'd): Such are the Holding down the Head; Putting out the Chin; Stooping in the Shoulders; Bending too much forwards; and, Thrusting out the Belly: Yet, I must take the Liberty to observe, That tho' such Defects are easily remov'd, by the Care of the Master, in young Scholars; yet in Adults, where such Habits have been long contracted and confirm'd, they require the utmost Skill, and Care of the Master, to correct.

I CANNOT quit this Subject without reminding you, That a Head justly plac'd; a gentle and easy Carriage of the Body; and a
true

Of Defects; Ill Habits, &c. 95

true Position of the Limbs; as it should be our first, so, it ought to be our greatest Care; since *these* be, what are always expected from us; and not without Reason; for without *these*, the performing Part of our Art will have no effect on the Spectator; nor, indeed, will such Performance merit the Name of Dancing.



ON



O N

S T A N D I N G.



HA V I N G in a former Lecture fully treated of the Structure, and Actions of the Muscles; we shall now inform our selves of the Operations they have on the Body, and Parts thereof; the various Motions of the Joynts, and those that proceed from them; by which we shall be able to find the mechanical Reasons by which such Operations are performed: And we will begin with *Standing*, or *Position*; a Speculation which will not only be useful and entertaining to us; but absolutely necessary for all who profess themselves Masters of the Art of *Dancing*; because the Motions in *Walking*, and most, or all, Steps in *Dancing*, are perform'd in *Positions*; nor can we well comprehend Motion in Going or *Dancing*, without a perfect Knowledge of *Position*, or Station.

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It will be requisite, for the better illustrating what we have to say on this Subject, to premise some few Explications of certain Terms in the first Principles of Mechanicks.

THE Center of heavy Bodies, or **Center** of Magnitude, is a certain Point in the middle of that Body, equally distant from its Extremities as much as possible, and to which all its Parts tend.

THE Center of Gravity is a certain Point in every solid Body tending to one common Center, through which any Plane being drawn, the Body will be always divided into two Parts of equal Weight, and ballanced in such a manner, as that the Parts on one side have neither more nor less Force than the Parts of the other side; but all the Parts remain in *Equilibrio*.

EVERY Line drawn through such Center is the **Diameter**, or the **Line of Gravitation**, **Propension**, **Direction**, or **Innixion**.

A **SOLID** Body will remain fix'd, if the Line of **Innixion** fall from the **Center of Gravity** perpendicular to the Horizon, within the Basis of such Body; but if such Line fall without the Basis of such Body, that Body must fall; but yet that Body may be prevented from falling, by adding another Body to it, or by translating the Line of **Propension**, as by the stretching out of a Man's Arm, &c.

THE Skeleton, or **Machine**, of Human Body, as has been already shewn, consists of

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several

several bony Columns, or Pillars, joyn'd to each other by round, smooth, and slippery Articulations; and upon Examination of the proper Station of each Bone, or Column, we shall find none of them plac'd in a perpendicular Bearing to each other. Two Thirds of the Head project from its Juncture with the *Vertebra* of the Neck. The Breast and Ribs project from the *Vertebra* of the Back, and Loins. Nor are the Articulations of the Thigh-Bones perpendicular to the whole *Vertebra*, but are plac'd before it; for which Reason, none of these Columns of Bone can be plac'd, erected, or retained, perpendicular, without their being supported, and knit together by the *Ligaments*, *Tendons*, and *Muscles*; for the Basis, or Extremities of these Columns, being, as I observ'd before, round, smooth, and slippery, the *luxations* terminate, and are in Points, and not in a plain Superficies, as Columns of Stone, standing upright by a firm touching all the Parts of a plain Basis.

It is allowed then, that the Bones of the Human Body serve as Pillars, which, by their Substance, and erect Position, and with the Assistance of the Muscles, sustain the Weight of the whole Body. They serve as Columns and Leavers at the same Time: Columns when we stand upright, and when the Bones support the Body; And as *Leavers*, or Leavers, when the Weight of the Body makes them bend.

EUCLID, in the sixth Book, and thirty third *Proposition* of his Elements, tells us, That in the same or equal Circles, the *Angles*, whether at the Center, or at the *Periphery*, have that Proportion which the *Arches* have on which they insist. And *Prop.* twenty nine, Book the third, If in equal Circles the *Angles*, whether at the Center, or Circumference, be equal, the *Arches* also on which they insist are equal; and if the *Arches* are equal, the *Angles* also will be equal. — Now the greater is the Angle the greater the Arch, and the greater the Arch is, the greater the Circle; and the greater the Circle is, the greater is the *Line of Direction*. Now it is a known Problem, That *Powers* are directly proportional to the *Fluxions* of their *Lines of Direction*; whence it would follow, That the *Strengths* of a Bone are proportional to their *Arches*; and, that those of the *Legs* are stronger, in Proportion to the Diameter of the circular *Canula*, which, in effect, is Truth; for we find that *Weights*, laid upon *Bones* in order to crush 'em, do exactly answer the Proportion nam'd; from whence we may admire the wonderful Providence of our Maker, in framing us in so mathematical Proportions, as He has done.

THE whole Frame being thus supported, and in an erect Position perpendicular to the Horizon, and these Pillars, or Columns of the Bones of the *Legs*, *Thighs*, and *Vertebrae*,

100 Of STANDING:

standing erect one upon the other; produce the Human Figure standing; provided the Line of *Propension* fall perpendicular from the *Center of Gravity* of the whole Body, either between both Feet, or upon one flat Foot, for otherwise it could not stand erect or upright, but would fall towards those Parts where the Line of *Propension* inclin'd. Yet even this erect Position, by reason of the roundness, and slipperiness of the Joynts (as we have before observ'd) would be unstable, were it not for the Assistance of the Muscles.

THE *Femur*, or Thigh-Bone, has its End oblique, to enlarge the Basis between the Legs; for were it not for this bending of the Thigh-Bone, we should with Difficulty preserve our selves from falling on one side.

WE very well know how difficult it would be, to erect a Needle upright upon a polish'd Plate; and, that the least Motion imaginable would move the Line of *Direction* out of its Place, so as to fall beyond the small Base of the Needle: But a Pike, or Staff, erected on the Fingers end, might easily be kept up, or pois'd, by reason of the quick Motion of the Hand following it where-ever it inclines; so that the Line of *Direction* may be kept either within the Base of the Pike, or Staff; or, when being a little swerv'd from it, may be, by that Motion immediately, reduc'd to its Place.

HENCE we may easily conceive, That a Man cannot stand firm upon the Heel of one Foot

Foot alone; because the Heel being round and globular, will touch the Floor almost in a Point, and so the Line of *Innixion* will fall from the *Center of Gravity* upon a Point; and it is requisite for a Man standing upright, that such Line of *Innixion* be perpendicular to the Horizon: But such a perpendicular *Innixion* upon the Point of one Foot alone, seems next to impossible to preserve firm and upright; because the Human Machine, and its solid and fluid Parts, can never remain quiet, when its breathing, and conflux of Humours, and numberless external Causes, will soon throw it down: Therefore a Man plac'd on either Extremity of one Foot, will always be in a continual State of falling, as if he stood upon a sharp pointed Stone, or on an acute piece of Timber.

NEVERTHELESS a Man may, with some little Difficulty, stand upon one flat Foot, because the Line of *Propension* may be kept within the Compass of the Foot, by the various Motions of the Body arising from the Force of the Muscles. But a Man will stand firm only when he stands upon both Feet; for then a Perpendicular being let fall from the *Center of Gravity*, may move between the two Feet, and in the quadrangular Space determin'd by his two Feet; but should he lean either forwards or backwards, without bending his Body, so that the Line of *Propension* should fall without the quadrangular Base, the

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Body

Body would consequently fall, unless by moving either of his Feet he suddenly bring it into the Quadrangle again.

By what therefore has been advanc'd, we learn, That a Man cannot stand upon his Heel, or Extremity of his Toe; that he may (though not very easily) stand upon one flat Foot (*viz.*) when the *Os Calcis*, or Heel; and Ball of the great Toe, or Sole of the Foot, touch the Ground. But to stand upright and firm, both Feet are required, the Line of *In-axiation* falling either between the Feet, or on one Foot.

THE Foot is not only long and large, but is divided into Toes, and hollow beneath, by which we keep ourselves more easily upright and firmer: The Foot also is supple, and complies with the different Formations of the Ground we stand on; as for Example, in mounting a Ladder, the Heel and Toe approach each the other, grasping the Round as a Hand; and does the same Standing or Walking in stony and irregular Places. As to its Form, it is not unlike the Hand, excepting, that the Toes are short and close, and the great Toe even with them; but the Fingers are long, and open wide, and the Thumb is opposite to them.

THE Gentlemen belonging to our Profession have given us five different Positions in Dancing, in which we may stand, and from which all Steps in our Art have their Origin,

Of STANDING. 103

nation, Progression, and Termination: And tho' we shall not pretend to multiply the Number they have allotted us, yet we shall take the Freedom of distinguishing a little upon them, and offer some Observations of our own, wherein, perhaps, they may have been deficient.

First, It may not be improper to observe to you, That the natural Situation of the Joynts is not strait, but a little bent; and that such Position of the Joynts is just and natural; and so consequently most graceful. For the Joynts are so form'd, as to be either extended or bent: The greatest Extension is, when the Joynts are stretch'd out in a Line; and the greatest Flexion is, when the Joints are bent to their utmost: 'Tis therefore reasonable to infer, That a Medium betwixt these Extremes (*viz.*) a moderate Flexion, or Bending, will appear to be the natural Constitution of the Joynts, and so consequently most easy, and less troublesome; for both Night and Day we experience, that no Posture in sitting, lying, or standing, is so easy to us, as when the Joynts are a little bent; and this appears really to be the natural Situation of the Joynts, and more obvious, because the Extremities of the Joynts cannot bear too great an Extension or Contraction, without a violent Distention and Compression of the Tendons, Membranes, and Muscles.

THIS being compromis'd, we shall proceed to *Position*, or Standing. And, first, in general, let us observe, That the Body should be erect, and that the Feet be turn'd outwards, in such manner that the Heels being join'd together, the two Feet, a Line being drawn from Toe to Toe, will make an *equicrural Triangle*, whose Angle at the Heels will be somewhat obtuse; for if such Angle at the Heels should be acute, then the Toes, though they are not really turn'd inwards, may yet be said by us (as a Term in our Profession) not to be turn'd out.

THE *Rotula*, or Knee-pan, ought to be directly in a Line over the Toe, or point of the Foot; so that if the Toe, or end of the Foot, should turn more out than usual, and the Knee keep in its just and natural Situation, such a one may be said to be splay-footed; or, if on the contrary, the Foot should be in its proper *Position*, and the Knees turning inwards, then such a Man will be call'd Baker-kneed. It therefore behoves us in our Art, to take a particular Care in preserving the Knee in its proper Situation; for that so preserv'd, will have consequently a very peculiar Effect towards the just *Position*, and regular turning of the Foot.

THE first *Position* is, when the Feet being join'd together, Heel to Heel, form (as I observ'd just now) an obtuse Angle. The Weight of the Human Body in this *Position*, may

may be plac'd either on both Feet, equally pois'd, and then the Line of *Propension* will fall between both Heels; or else, the Weight may be upon one Foot only, and then the Line of *Innixion* will fall from the Center of Gravity upon that Foot on which the Weight depends, the other Foot just bearing on the Floor, and its Knee somewhat bent. Tho' this *Position* may be us'd in standing, yet it is not the most graceful Posture for this purpose.

THE second *Position* is, when the Feet, from the first *Position*, separate one from the other side-ways in a strait Line; and which I shall distinguish into a short Second, and a long Second: The short Second is, when the Distance of the Feet from Heel to Heel does not exceed much above five Inches; and the long, when its Separation extends to seven, eight, &c. The Line of *Propension* in this *Position* falls generally between both Feet, and then the Weight of the Body is equally supported by each Foot; the Knees strait: And this *Position* is one of the graceful Postures of standing; but in the short Second, the Line of *Innixion* may be in one Foot.

THE third *Position* is, when the Feet are joyn'd close together, but inclosed one Foot before the other, so that the Heel of the foremost Foot touch the side of the Instep of the hind-foot. This *Position* has the same *Propension* and *Innixion* with the first, and seems to be in all other Points the same.

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THE fourth *Position* is the most useful of any, and is distinguish'd into the Long, and the Short: This *Position* arises from the Feet being one before the other, not crossing, but so that a strait Line may be drawn between both Heels: The Long is, when the Foot is extended forwards upwards of six Inches, and then the Line of *Propension* will fall between both Feet: And the Short Fourth is, when one Foot is not advanc'd above six Inches before the other; this Short Fourth is the most graceful Posture of standing; the Line of *Innixion* falling on the hinder Foot, and the former just bearing on the Ground, the Knee of the former somewhat bent. It is some Addition to the Gracefulness of this Posture in Standing, when it borrows something from the second *Position*; and may then properly be call'd an open Short Fourth: And this may imply, that there is an open Long Fourth: And if the foremost Foot should from the third *Position* move strait forwards into this Fourth, it will then assume the Name of an inclos'd Fourth, which may, perhaps, some Time hereafter give room for adding to these another distinct *Position*.

A TRANSITION of this *Position* from one Foot to another, translates the Body from one Place to another, and produces what we call Walking. As this *Position* is the most graceful Posture of Standing, it is requisite that we endeavour to account for the Beauty of it, by shewing, that it is also the most natural.

EXPERIENCE informs us, that it is easier, and less tiresome to us, to stand on one Foot (that is, the greatest part of the Weight of the Body resting on one Foot) than on both together; for when we stand on both together, some of the Muscles are in a continued, or Tonic Action; but when we stand first on one Foot, and then on the other, the Action of the Muscles is alternate; tho' some have imagin'd, that when we stand on both Feet, all the Muscles of both Legs, as well Benders as Extenders, labour under a Tonic Action; and that by changing the Weight of the Body from one Foot to the other, those Muscles belonging to that Leg on which we stand act only; and that the Muscles of that Foot which before carried the Weight are at rest, and have little to do till that Foot again returns to its Duty of relieving its Fellow. This Change (say they) is less laborious, and we are not near so soon weary, as when the Weight is equally divided and supported by both Feet. But the Falsity of this Assertion will appear plain upon Examination; for it is allow'd, that a Weight of ten Pounds will be sustain'd in the right Hand only, with less trouble by half, than if another Weight of ten Pounds was also sustain'd in the left Hand at the same Time; for then the double Weight of twenty Pounds is lifted with both Hands as with one Hand alone: But that the same Weight of twenty Pounds would be easier lifted with one Hand, than if divided into

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into two Parts, ten Pounds were equally sustain'd by each Hand, is false. In the same manner, the Muscles of one Foot would be more fatigu'd in supporting the Weight of the whole Body, than if the Weight were divided on both Feet, so that each Foot might bear its equal Proportion. And, by the by we may observe, that when we can hardly move a great Weight in one Body yet when we divide that Body, we can with Ease lift and carry the same; because the Power of the Muscles is sufficient to overcome the lesser Resistance, and their Fibres are less hurt and distended.

MOREOVER, we perceive that the principal, and chief Cause of Weariness, and Trouble of the animal Faculties, arises from a continued, assiduous, and tonic Action of the same Muscles; when, on the contrary, we can with less trouble sustain heavier Weights, by an interrupted Action, and alternate Restings; so we may conceive, that we can with less difficulty continue a progressive Motion for a longer Time, than we can remain in a standing Posture; the former being an alternate Action of most of the Muscles; the latter a continued, or tonic Action. And it's manifest, that an alternate *Position*, sometimes on one Foot, and sometimes on another, is a sort of Change, like Walking: For such is the desire and love of Change, that in sitting we often lay one Leg cross the Thigh of the

other,

other, and then remove that which was uppermost, and lay it in the same manner upon the other; and this alternate Transposition, although it be troublesome, and the Thigh which is under is press'd by its own Weight, and the Weight of the incumbent Thigh, yet, I say, such a Change is wonderfully refreshing and delightful.

THE fifth *Position* is, when one Foot is extended before the other, and the Legs cross'd: This is never us'd as a Posture for standing, and is only necessary for the Rise, or Terminations of some few Steps in Dancing.

THERE are in Dancing five other *Positions*, which they call the five false Positions, but very improperly so; for they are not Positions, but an irregular Motion of the Feet; that is scarce worth our Notice.

HAVING shewn the Nature and Manner of Station and *Position*, we shall now examine how the Body, in a State of Falling, may be recover'd, and preserv'd upright; though (as has been observ'd before) whenever the Line of *Propension* of Human Body shall fall without the Basis of the Foot on which the Body stands, and is supported (*viz.*) without the Quadrangle comprehended by the Feet, then such Body must absolutely fall, nor is it in the Power of any of the Muscles to prevent the same. Some have suppos'd, that the erect, or upright Posture of Man, is preserv'd by all the Muscles, Flexors, as well as Extenders, opera-

operating in a tonic Action: But they would soon be convinc'd of their Error, by considering, That Falling may be either forwards, backwards, or side-ways: In Falling forwards the Legs bend towards the Feet, and the Spine towards the Knees; for the Thigh-Bone cannot bend forward at the Articulation at the Knee, without a Dislocation of the Joynt; but the Inclination of the Angles of the Foot and Thigh cannot be stop'd and dilated, or enlarg'd, but by the extending Muscles of the Foot (*viz.*) the *Soleus* and *Gluteus*, and not by the bending Muscles of the same Joynts; for those would rather contribute to the Fall, therefore they remain idle: And thus a Bending, and Falling forwards, can be prevented by the extending Muscles only, and not by the Extenders and Benders, operating together in a tonic Action.

FALLING backward is, when the Foot being too far extended, the Thigh bending inwards, and the Spine inclining backwards; therefore the Bending at the Knees can only be straiten'd by their extending Muscles, and not by their Benders: But yet too large an Extension of the Foot, and backward bending of the Hip, is prevented by the bending Muscles of the Foot and Thigh.

IN like manner, a Falling side-ways may be prevented, and recover'd, by the Extension of the Muscles plac'd against that falling Side; therefore it appears, That Men do not
stand,

Of STANDING. III

stand, supported by the tonic Action of all the antagonist Muscles, but only by the Operation of all the Extending, and some of the Benders, while some of the bending Muscles at the Knees are at Rest; whence it arises, that the tonic Action can be only in the Feet and Hips, and not in the Knee.

By what has been said we may conclude, that a tottering, or a falling State of the Body, (that is) when the Line of *Propension* does not fall without the Basis of the Foot on which the Body is supported, or without the quadrangular Space determin'd by both his Feet; I say, such a Falling may be prevented by the bending Muscles, or Extenders of the Feet and Legs: But when the Line of *Propension* falls without that quadrangular Space so determin'd by the Feet; then, I say, the Body must consequently fall; except the Fall be prevented by mechanical Helps. And after what manner that may be done, we shall endeavour to shew.

WHEN the Body, departing from the Line of *Innixion*, is in a falling State, its Motion of Falling is at first slow and weak, so that a Remedy may be the easier applied; for a quick Motion of the Head or Breast, arising from the animal Force of the Muscles opposite to the falling Side, will recover the Body to its Line of *Innixion*, and its Fall so prevented: Such Recovery is also made by a quick Extension of the Leg or Arm opposite to the fall.

falling Side; for by such an Extension the small Weight of the Arm acquires a much greater Weight from the length of its *Vectus*, and the Center of Gravity is chang'd, and the Body brought upright.

FOR the lunated *Sinus* of the *Sternum* between the Heads of the *Clavicula*, hanging perpendicular over the Foot that supports the Body, will, upon the stretching out of an Arm, quit its Perpendicular, and gain a new Position; it will do the same upon the Leg, being thrown backwards.

THIS may be further demonstrated by Rope-Dancers, who poize themselves not only by the length of their Pole (which Pole, like a Ballance, inclines sometimes to the right, and sometimes to the left); but also, when the Danger of falling increases, the Pole strikes the Air violently towards that side, and so the Body is reduc'd to an erect and upright Posture.

TO conclude, it is worth our Observation, That such an artificial, mechanical Motion, is by Custom and Habit, acquir'd by us from our Infancy, and without our taking the least Notice of it; and it's to be admired, that in such Variety of Motions in Running, Leaping, and *Dancing*, this Law of Nature, of Ballancing, and equally Poizing our Body, is so nicely observ'd; and, that whenever it is neglected, or affectedly transgress'd, Falling consequently follows.

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Of STANDING. 112

HENCE also it is, that standing with ones Back close up to a Wall, the Breast cannot be bent forwards without falling; for it is absolutely necessary in Standing, that the Line of Propension fall within the Basis of the Feet.

FOR which Reason also, a Man sitting on a Chair, his Breast and Legs being perpendicularly erect to the Horizon, cannot possibly rise off his Seat; because in such a Position the Center of Gravity of the Breast and Hips, fall a great deal behind the Soles of the Feet, therefore it is impossible to rise, except the Head and Breast be very much inclin'd forwards, or the Legs drawn backwards, and then from the Change of the Center of Gravity, and the Force of the Muscles extending the Knee, the Buttocks, and Breast, will be rais'd up, and the Body brought forwards.





OF WALKING.



WALKING is perform'd by an alternate Change of the Feet; and transferring the Line of *Propension* from one Foot to the other, and by that Means translating the Body from one Place to another; in which alternate *Innixion* only half the Weight of the Body seems by turns to be lifted up and carried; as we may apprehend by a Truncheon, of about two Foot long, being laid on the Ground, or on a Table, and by lifting up one end, and moving it forward about eight Inches; the other end being as a *Pivot*, and *Axis*, round which it moves; and in such a Case, the Power lifting the end of the Truncheon is equal to half the Weight of the whole Truncheon, because that the other half of the Weight is supported by the Ground, or Table; then laying

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ing that end down, and taking up the other, which before lay still, move as before. But All-wise Nature has contriv'd a more compendious Method for Walking; for less than a fourth Part of the Human Weight is by turns lifted from the Ground by the Force of the Muscles.

'Tis evident, that a Man could not walk if his Feet were raised alternately from the Ground, and set down again in the same Place from whence they were taken up; but it is required, and it is absolutely necessary, that the Situation, or Position, should be chang'd, and the Weight of the whole Machine of the Body brought forwards. Now let us examine, by what Organs, or Operations, this Motion is perform'd.

At first sight Human Walking seems to resemble the Motion made by a Pair of Compasses erected on a horizontal Plain, or on a Table; which when first erected, in Standing will make an *equicrural Triangle*, and the Line of *Propension* will fall precisely between both its Legs. You will easily apprehend, that to make these Compasses (if I may so say) walk, one Leg must be lifted up, and the other on the Ground; then if one Leg is lifted up from the Place, high enough to make the Line of *Propension* fall into the Line of *Inuersion* of the other Leg, on which it stands, and which Leg then will be perpendicular to the Horizon; then in wheeling, or turning the

Compasses about the *Axis* of the fix'd Leg, the moving Leg will describe a conic Superficies; then let the Leg before lifted up, be set down, and then the Compasses will, as at first, be erect, and form again an *equicrural Triangle*. Then let the other Leg, on which the Compasses was before fixed, be lifted up, and turn and move, as its Fellow had done before, and so, by this alternate Motion, and turning of the Compasses, a Motion forwards is produced, not unlike that of Walking.

BUT such a manner of Moving for us, would be very absurd and troublesome, therefore Nature has contriv'd, for the Human Machine, a more elegant and easy manner of Motion; for having form'd the lower Extremities, or Limbs of several Parts, joyn'd and articulated together, the Flexions from them produce an easy compounded Motion: For as we stand in the fourth *Position*, both Feet equally bearing on the Ground, the Line of *Propension* (as has been before observ'd) will fall between both Feet, and form the Triangle call'd *Isoceles*, or *Equicrural*; and from this *Position* it is, that Nature forms, and brings about several Motions, from whence Walking takes its Rise.

AND though such an *Isoceles Triangle* is like that made by the Compasses, yet the Limbs (not being form'd of one Piece, as those of the Compasses) by reason of its Flexions, acquires a much easier Motion.

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THE Pillar of the foremost Leg, *viz.* the *Tibia* and *Femur*, turning upon its Center, the Foot becomes Perpendicular to the Horizon, and the whole Human Machine moves forwards at the same Time, and such Motion is thus brought about; for by extending the hinder Foot prolong'd by the Muscles *Solei*, an obtuse Angle is made at the Heel from the Hip and Toe; and because the end of the Foot, or Toe, touches the Ground, the Length of the Hip and Leg is increas'd, by the Addition of the Length of the Foot, and so the *Triangle Isosceles* is alter'd, and the Feet then making a right Angle *Triangle* (to wit) when the foremost whole Leg stands Perpendicular to the Horizon; it is to be observ'd, in this whole Action, that the Weight of the Body being in this *Position* supported by both Feet, the least Motion possible will bring it forwards, so that the Leg may stand Perpendicular to the Floor; because from the same Extension of the Foot, and Elongation of the whole Leg, the Floor is press'd by the Toe, or end of the Foot, and by a reflected Motion from thence, the Human Machine moves forward, not unlike a Boat push'd from the Shore by a Boat Pole. Moreover, such an Impulse is wonderfully assisted by the least Inclination of the Head and Breast, and so the Line of *Propension* inclining over the Confines of the Foot, the Body ready to fall, and of its own accord pressing forwards, such Fall is soon prevented,

by lifting up the Hind-foot, and bringing it forwards, beyond the Confines of the Line of *Propension*; and by that Means you are again set upright. And by this artificial Manner, in progressive Motion, the Human Machine is moved forwards; which we shall farther explain, in describing all the Motions us'd in Walking.

WHILE a Man walks, his weighty Fa-
brick always bears on the Ground fix'd, and is
supported by the bony Pillars of the Limbs;
which Bearing is effected, and assisted, by a
little labour of the Muscles, and some small
trouble to the sensitive Faculty, by reason of
a Compression of the Tendons, and a Disten-
tion of the Membranes. Further, while we
stand on both Feet, in the fourth *Position*, the
Motion of setting forward the Center of Gra-
vity, or the moving of the whole Body for-
ward, arises by the whole hind-most Limb
being lengthen'd by the Extension of its Foot,
by pressing the Ground with the Toe, or end
of the same Foot; raising up the Heel erects
the whole Machine perpendicular upright and
firm upon the fore-most Foot: The hind-most
so lengthen'd, is presently rais'd from the
Ground, the three Joynts, of the Hip, Knee,
and Foot, being a little bent by their proper
Muscles, which supports less than a fourth Part
of the Human Weight, and by the Force gain'd
by the foregoing Impulse, and from a Bending,
or Inclination forwards of the Head and Breast,
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the Hind-foot moves forwards, and is fix'd on the Ground beyond the *Position* or Situation of the firm Foot; by which Means a second Station is attain'd; and then the Hind-foot operating at the same Time, in like manner as before, a progressive Motion is continued.

Now Gentlemen, it will not be improper next to observe to you, That we cannot walk precisely in a right Line, because the Human Machine cannot go, unless it successively bear upon the Ground by an alternate Motion of the Feet; and such a Bearing is caus'd, by transferring the Line of *Propension* one while upon the Sole of the right Foot, and another while upon the Sole of the left Foot; and such a Translation is not carried on in a strait Line, but by two right Lines parallel to themselves; for 'tis plain, in observing the Tracts of Mens Feet, walking in Dust, Sand, or Snow, that the Steps will appear Parallel in themselves, and not to make one right Line in Transition. Moreover, Geese, Ducks, and broad set Men, who have short Thighs, do not plainly move their Feet in two parallel Lines, but by a certain Wadling, walk alternately, by raising themselves sometimes on the right, and sometimes on the left Foot, and by transferring the Center of Gravity: We all do the same Thing, though not so manifest, or in so great a degree. For take two Rods, and erect them Perpendicular upon some Bowling Green, or even Ground, one being White and the other Black;

let them be so erected, at some considerable distance one from the other, and let a Man stand in a direct Line with the Rods, the black Rod being next to him, so that it may cover the white Rod; then, though he use his Endeavours to go precisely in the same right Line, he will find he cannot effect it; for he will see by turns the white Rod one while on the right side, and another on the left of the same black Rod, that is between him and the white Rod; and which, I presume, will be a sufficient Argument that we cannot walk precisely in a right Line. For, again, the Line of Propension being transferred on each side, in a waving, and serpentine Course, the Human Machine cannot perform this progressive Motion, call'd Walking, by one simple strait Line.

WALKING on level Ground, or on a Floor, is not only easy to us, and no Ways troublesome, but it is also pleasant, because in Walking the Joynts bend only by an insensible Flexion, and just sufficient to prevent the Sole of the Foot from striking forcibly on the Ground or Floor: So that the bending Muscles in this Motion have but little trouble, for the Soles of the Feet are not oblig'd to be bent and unequal, or suffer a too great Distention or Luxation, as they must necessarily have done in complying with irregular and uneven Ground, and walking upon sharp Stones, &c. The Motion therefore of the Joynts in walking

ing on even Ground, not being laborious nor troublesome, is easy and pleasant, and assists the Circulation of the Blood; increases the animal Spirits; helps Perspiration; invigorates and refreshes all the Parts of the Human Body, if not continued too long, or used too violently. This may give us no little Idea, how healthful an Exercise that *Dancing* must be which we profess; because, the *Dancing* taught by us to Gentlemen and Ladies, is not only a Motion natural and easy, and without too much bending, or extension of the Joynts, but the Variety of the Motions makes it still more agreeable; and as (I have observ'd before) by the natural Love we have to Change, a Continuance of such Motion seems to be less tiresome, and more pleasant, than Walking.

BUT a Walking up a steep Place is very tiresome, because such Ascent in its Action, is like that of going up Stairs, or up a Ladder, which we find, experimentally, to be very troublesome; nor is the Cause of such an Effect hard to be found out, when the Operations of the Joynts, which are made in such an Ascent, are duly, and exactly consider'd; for in standing upon both Feet in the lower-most Round of the Ladder, suppose the right Foot to be lifted up Perpendicular to the Horizon, in order to attain the second Round; such an Elevation must first be higher than the second Round, and cannot be made without a great deal of bending of the Joynts; in which the
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natural Length of the bending Muscles will be loosen'd, and so there will be a violent Contraction of them by a laborious Endeavouring; again, from the Impulse of the Innixion made by the same right Foot, before it leaves the first Round; and from the Inclination of the Head and Breast, the former Center of the Gravity of the Human Body, is mov'd forwards; and so when the same right Foot bears on the second Round of the Ladder, then the Line of *Propension* falls Perpendicular upon the same Foot so placed upon the second Round, the left Limb hanging down; now the right Limb being bent, and bearing on the Sole of the Foot upon the second Round, must be directed Perpendicular, and the whole Weight supported by the same right Limb; but such Operation cannot be effected, unless the Inclinations of the three Joynts, the Hip, Knee, and Heel, be lengthen'd and extended; which Action is difficult, because the whole Weight of the Human Machine ought to be rais'd Perpendicular; and therefore the fourth Part of the Weight of the Human Body ought to be twice sustain'd, and suspended by the Force of the Muscles, in ascending one Round of the Ladder; and the whole Weight of the same Man once; of Consequence then, the faster we climb the Ladder, the more laborious and troublesome it will be: For let us consider, that in Walking on a plain Superficies, or even Ground, the whole Weight of the Human Body

Body is never suspended, or elevated, by the Force of the Muscles; because it is always bearing upon the Ground, either on one Leg or the other, supported by the bony Columns. But in an Ascent by Steps, the Elevation of the Weight of the Body is made by the Force of the Muscles, and not by the Hardness of the bony Columns; and hence it is, that such Ascent becomes so laborious and troublesome, and so soon brings on Weariness. Moreover, in an Ascent of a Hill, or the like, as we stand on the Ground, the Soles of the Feet make Angles with the Legs; in which unnatural Position, the extending Muscles are too much distorted, nor is the *Inixion* firm; therefore laborious and troublesome.

A W A L K I N G down Hill is also more tiresome to us; than going upon an horizontal Plain; for in a Descent, either by Steps, or on a declining Plain, neither the Thighs, nor the whole Machine of the Human Body, ought to be elevated, or raised upwards; for it falls of its own accord, by the Force of its own Gravity; and for this Reason a Descent is commonly thought to be most easy. But let us more strictly examine into this Affair, and it will undoubtedly appear, that a Descent, or Walking down Hill, and the like, is not perform'd without great Labour and Pains. As for Example, let the right Foot be a little lifted up, so that a Man might leave his Station on the highest Part of a Ladder; and then,
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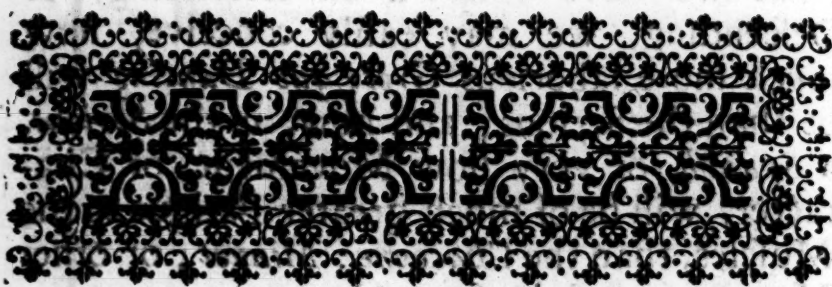
if the Center of Gravity be mov'd forwards, the whole Weight would undoubtedly fall; and the Foot being directed towards the next Round, would be dash'd against it with much Violence and Pain; but such a Misfortune will be avoided, by retaining the Center of Gravity in its old Situation (to wit) by keeping the Line of *Propension*, and preserving the Body erect Perpendicular upon the Sole of the Foot, bearing upon the first Step; then the whole Body descending, the Joynts of the Limb that bears on the Round becomes bent, and the other Limb moving downwards, being stretched out, the whole Machine is supported till the descending Limb reach the next Round, and such a Sustainment of the Weight of the Body by the Muscles, is not without a laborious Action of the extending Muscles, sensibly easing themselves; and such Labour of descending is so much the greater, by how much more slowly we descend the Steps. Now, such a Necessity of Sustaining is not required from the Muscles in walking on level Ground, because that alternate Suspension proceeds from the hardness of the bony Columns; by which we conclude a Descent more laborious than walking on level or plain Places.

And in descending a steep, plain Superficies, the Soles of the Feet (as in the Ascent) make also Angles with the Legs; which unnatural Position is very laborious. From
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what we have observ'd on Ascending, or Descending, we may easily conceive, how much more laborious *Groteſque Dancing* will be than the Serious; and how, in the *Serious*, a *Spaniſh*, or very ſlow Movement, or Character, will be of much greater Fatigue to the Muſcles, than the *Chaconne*; *Minuet*; or other Movements of the ſame Nature.



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Leaping, or Springing.



LEAPING, or Springing, differs from Walking in this, that in Leaping the whole Body is thrown into the Air, both Feet being at the same Time elevated from the Ground or Floor; but in Moving, or Walking, the Body always bears on the Ground or Floor, either on one Foot or other; in which alternate *Innixon* it appears, that half the Weight of the Body is, by turns, supported and moved, (as before).

THIS Springing, or Leaping, cannot be perform'd, except the Joynts of the Limbs are first bent.

FOR 'tis plain, that a Man standing with both his Knees strait, and his whole Body directly upright as a Pillar, let him be ever so will-

Of Leaping, or Springing. 127

willing, and use his utmost Endeavours, he will never be able to spring, or leap, from the Floor; because Springing, or Leaping, is produc'd from a considerable Flexion, and bending of the Joynts; and then by the extending Muscles being contracted, and drawn with great Violence. Some Brutes, or Insects, who have all their Limbs, or at least their hinder Limbs, always bent, leap naturally, and with much ease; but when they would leap to any considerable Distance, or Height, they are then oblig'd to bend the Joynts more than usual.

To explain better the Nature and Manner of Leaping, or Springing, take a Whale Bone of any length, it is indifferent; but suppose of two Foot long; set it upright an end on the Table, then, as you hold the upper Part in your Hand, the other resting on the Table, with your Hand press down the upper Part of the Whale Bone, so that then it being bent, it will make a curv'd Figure like a Bow; then suddenly taking off your Hand from the Whale Bone, you will find, that it will not only regain its Direction, but will also spring up, and be lifted from the Table by a quick Spring or Leap: The Cause of which I shall endeavour to shew. The Center of Gravity of this Whale Bone, as it is upright, will be in its middle, that is, a Foot distance from the Table, but when press'd by the Hand to the curv'd Figure, like a Bow, the Center of Gravity

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vity will then fall some Inches lower ; so that when the Hand is taken away from the top ; the curved Bow dilates it self with some Violence, and extends both Ends directly to recover its first Center of Gravity ; but as the Table prevents the lower End from extending it self as the upper does, such Impediment occasions a reflected Motion, as well as a directed Motion, and necessarily forces it from the Table, and produces what we call **Leaping**, or **Springing** ; for after the Whale Bone has acquired such an extensive Direction, its force does not cease, but continuing still farther, raises it from the Table as if it had been thrown from thence.

By which we may conceive, That the Human Figure standing upright, so that the Bones of the Thighs, Legs, and Spine, compose an erect Column, standing Perpendicular to the Horizon, the common Center of Gravity will be distant from the Floor the whole length of the Legs and Thighs ; afterwards by bending the three Joynts, the Hip, the Knee, and the Heel, till they make acute Angles, the Center of Gravity will then be distant from the Floor about the length of the Leg only, which is much about half the Distance of what it was when the Body was upright ; if then, from this Posture, the Muscles *Glutei*, *Vasti*, & *Solei*, are forcibly, suddenly, and at the same Time, contracted, the three bended Joynts will then be extended with great Force, and by
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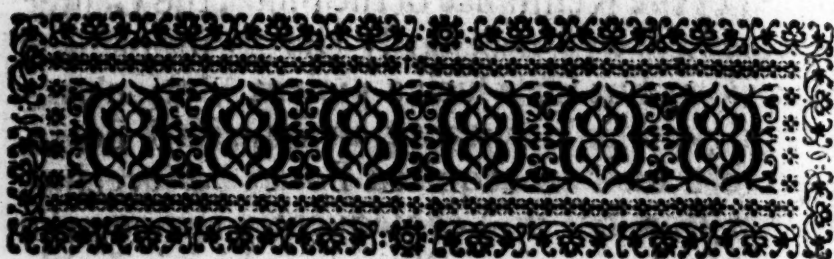
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reason of the Resistance of the Floor, the Center of Gravity will necessarily rise to its pristine Situation; but since such a violent Motion cannot be perform'd without an impress'd Force, therefore such an acquired Force persevering, cannot stop, but will consequently remove the whole Body from the Floor on which it stood; which is Leaping, or Springing; and again, such Leap will force it self through some Space, as long as the Force of the Gravity, by little and little increasing, becomes equal to the Force of such Rising, and then the Body will fall down again to the Place from whence it sprung or leap'd.



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RULES



RULES AND INSTITUTIONS FOR DANCING.



HAVING in the foregoing Lectures endeavoured to inculcate, how requisite some *Anatomical* Knowledge of the Bones, and Muscles, of the Human Body; and how useful a little Skill in *Mechanicks*, would be to the Masters in the Art of *Dancing*, I shall venture to say, That without such a Knowledge, and Skill, *Dancing Masters* will never arrive to any Certainty in their Art, either in the Performing, or Instructive Part; but will be always liable

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liable to vary, and change their Manner of Performance, and Method of Teaching, according to Fancy, or Opinion. For 'tis plain, that without Rules there can be no Art; and also, that 'tis impossible to be Master of any Art without the *Theory*; since upon that Foundation 'tis, that the Practice must be built. And I flatter my self I shall be able to evince, That the whole Art of *Dancing* depends upon the foregoing Rules; and, that from an excellent Skill in the practical Part of this Art, and a perfect Acquaintance with the Rules and Institutions of it; great Improvements may be deriv'd to our Profession, which will not only a little add to its Reputation, but be also of universal Benefit to all Lovers of Elegance and Politeness.

IN order to demonstrate which, we shall begin with Standing; and shew, from whence the Presence, and Gracefulness of that Posture arises.

STANDING in a graceful Posture, can be only in two of the five *Positions*; for a Man, (*viz.*) in the second *Position*, either long or short; and in the short Fourth. And for a Woman, in the First; short Second; and short Fourth *Positions*.

WHEN a Man stands in the long Second *Position*, his Body will be equally pois'd on both Feet, the Line of Propension falling from the Center of Gravity between them; but in either of the other *Positions*, as well for the

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Man as for the Woman; the Weight of the Body should be on one Foot, the Line of In-nixion falling thereupon; and the other Foot bearing a little upon the Floor, and its Knee somewhat bent. The Gracefulness of this Posture requires the Body to be erect, the Head upright, and easy, and always a little inclining, or somewhat turn'd towards one side or the other; its Motion to be free, natural, and various; which gives an Air and Vivacity to the whole Body: The Shoulders not shrug'd up, or thrust forwards, but hanging easy in their natural Situation; and the Chest, or Breast, extended, that it appear full. Though the Placing, or Disposition of the Arms and Hands alter, and vary according to Fashion, Fancy, and Opinion, yet there are some certain Rules we cannot deviate from, without breaking in upon that Harmony arising from the regular Disposition of the Parts, which produce Gracefulness. We are therefore to take care the Elbows be not press'd too close to the Body, nor set too much out; neither are they to be drawn too much backwards, or brought too far forwards; but to fall easily down, and not to appear Stiff or Obstinate; and, that the tip of the Elbow be plac'd even with the middle of the Sides of the Body.

THE Position of the Hands ought to be directed, or govern'd by the *Position* of the Feet: they will either be both the same, or

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contrasted, (that is) when each Hand has a Position not only contrary each to the other; but also a contrary Position to the Foot of the same side. The Fingers should be a little bent, and open from each other.

IN Walking gracefully I shall only remind you, that Walking is perform'd from the fourth *Position* to the fourth *Position*: That one Foot is always on the Floor, and the Line of *Direction* is transferr'd from the Basis of one Foot to the Basis of the other. The Heel always moves first from the Ground, and is first put down again. The Motion of the Body is continued, and should be very easy and natural. The Members equally ballanc'd on their Center; and the Motion of the Arms and Feet contrasted; which Contrast seems to me to be the very Soul (if I may be allow'd that Expression) of Gracefulness.

IT is worth our observing, that the Rules laid down, for these and the following Actions, or Motions, are according to the Dictates of Nature; agreeable to the Laws of Mechanism; and consonant to the Rules of Proportion: And, that whatever Positions, or Motions, derogate from these Laws and Rules; such Attitude, or Action, will be absurd, awkward, disagreeable, and ungentile.

WE will now lay down the Rules for, and the Motions of (what we call in our Art) the making an Honour.

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THE Honour, or Bow, for a Man, we shall take from the most graceful *Position*, (*viz.*) the short, open Fourth; Rules for which will be sufficient Information to us, for all the Performances of this kind.

SUPPOSE then the Man standing in the open, short Fourth *Position*; and the Line of *Innixion* from the Center of Gravity falling on the left Foot, which is behind; then the right Foot, which is foremost, will bear only lightly on the Ground or Floor, the Knee somewhat bent; then, from this graceful *Position*, let the right Foot move to the short, second *Position*, the whole Body moving with it, and the Line of *Innixion* be transferr'd from the left Foot to the right, the left Foot will then bear only lightly on the Floor, the Heel somewhat rais'd from thence, and Knee strait; then by drawing the left Foot so rais'd on its Toe, along the Floor, until it fall behind the right Foot in the short inclos'd fourth *Position*, the Line of *Innixion* will again be transferr'd from the right, to the left Foot; the right just bearing on the Floor, and the Knee somewhat bent as before. The Rule for Bowing, or Motion of the Body is, (as I take it to be) as follows. The Motion of the Body, and Motion of the Feet, should be both at the same Time, and end together: (that is) The Inclination, or Flexion of the Body, or the Bowing, should begin, and continue with, and during the Motion of the first Step, and the Extension,

or

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or Erection of the Body, should commence, and gradually rise with, and during the Motion of the second Step: So, that all the Parts of Body, and Limbs begin, and finish their Motions together. The Hands and Arms in this Action will fall naturally forwards on the Flexion of the Body, and return on the Erection to their former Situation.

THE Honour for a Woman is commonly call'd. a *Curtesy*; a Rule for making which, in general, will be best explain'd, by describing a regular Method, and Manner, of a young Lady's making her Honour before she begins to Dance.

WE will then present her to your View standing in the short Second, or short Fourth *Position*; her Body erect; her Head upright; and her Arms falling naturally to her Sides; not bearing upon the Hips, but just freed from the Body; the Cubit and Hand, together with the Arm, extended obliquely downwards; the fore Finger and Thumb taking hold of the Petticoat; the Wrist even, and turn'd a little outwards; the Palm of the Hand towards the Thigh; the whole Arm unconstrain'd, neither pressing on her Coat, or displaying of it. The whole Weight of her Body being then supported on her left Foot, the right just bears on the Floor; from this graceful *Position* she sinks, her Knees bending outwards, the Line of *Innixion* still continuing on the same left Foot: Just at the Con-

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clusion of her Sinking she transfers the Line of *Innixion*, by the Motion of her Body from the left to the right Foot; and then rises Perpendicular, still preserving the Weight on her right Foot, which finishes her first *Curtesy*.

I NEED not inform you, that the Gracefulness of this Action arises from the Motion of transferring the Line of *Innixion*; to which a little turn of the Head towards the left Shoulder, is no small Addition.

THE left Foot now being at liberty, and bearing slightly on the Floor, is ready to move; she then carries the left Foot obliquely forwards to the inclos'd fourth Position, her Body moving with it, and so transferring the Line of *Innixion* from the right to the left Foot; she then moves the right Foot circularly, at the same Time turning her Body a quarter Turn towards the left, and brings her Feet into the short second *Position*; the Weight of the Body also, as in Walking, transferr'd with it: The Weight being now on the right Foot, she sinks; transfers the Line of *Innixion*; and rises as before; the Weight of her Body is now on her left Foot, and the right Foot bearing only on the Toe, is ready to move.

THIS leads me to a farther Application of the foregoing Rules, to some of the fundamental Steps, and Movements in Dancing.

BUT, *First*, It will not be improper to explain, what Dancing is, and in what it consists.

DAN-

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DANCING is an elegant, and regular Movement, harmonically composed of beautiful Attitudes, and contrasted graceful Postures of the Body, and Parts thereof.

THE Motion consists of various Steps, produc'd by the Sinking, Rising, Turning, and Springing of the Body and Limbs.

SINKING is a Flexion, or Bending of both the Knees, and is us'd in every Position; the Line of Propension sometimes falling betwixt both Feet, and sometimes upon one; though there are some Steps in Dancing, that require only one Knee to be bent, while the other is mov'd extended. A Sink should always be made on the flat Foot (*viz.*) when the *Os Calcis*, or Heel, and Ball of the great Toe, are implanted to the Floor.

RISING is an Extension from a Flexion, or Bending of the Knees, and is the Antagonist to Sinking. There is also a Rising when the Knees are strait, and that is on the Toes.

* The Bones of the Foot united together, may be compared to a Lever plac'd under any great Weight in order to raise it; for the convex Part of the *Talus* being plac'd just under the *Tibia*, which sustains the whole Body; the long hinder Process of the *Os Calcis* being, as it were, the handle of this Lever, and so rais'd by the *Nervus Hec-*

* Baker on the Bones.

* *ricus*,

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‘*ricus*, which is strongly inserted there. This
‘ Nerve, or rather Tendon, is compos’d of
‘ three or four Tendons of several Muscles of
‘ the Leg, as *Solaris*, *Gasterocnemij*, &c. and
‘ with it the whole Body is raised upon the
‘ Toes.

THIS Sinking, and Rising, seems to be to Dancing, as Light and Shades are to Painting.

THE first Movement, in Dancing is a half *Coupee*, and is only one Step, or one Movement; it is to be perform’d several Ways, as forward, backward, sideways, obliquely, open, and circularly, &c. and may be taken from the First; the short Second; the Third; or short Fourth *Position*: But in shewing the Manner of its Performance, I shall take it from the first *Position*, and perform it strait forwards.

THE Weight of the Body, in this Step, will be always on one Foot; and the Line of *Innixion* transferr’d (as in Walking) from one Foot to the other. The Line of *Innixion* falling therefore on one Foot; Sink; the Knees bending outwards; let the Foot that is free from the Floor move forwards at the same Time as the Sink is performing; the Body is upright, and insensibly moves a little with it, but not beyond the Basis of the standing Foot; then the moving Foot being brought forwards, and set down in the short Fourth *Position*, extends it self at the same Time, and trans-

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transfers the Body thereupon Perpendicular to the Horizon; the other Foot coming into the first *Position*, bears lightly on the Floor, and is ready to move, as before. The Hands and Arms, in this Movement, will be contrasted.

A *COUPE'E* begins in the same Manner, and with the same Motions, as the former; only the half *Coupee* being but one Step, if continued, will be perform'd alternately, first with one Foot, and then with the other; but this *Coupee* being compos'd of two Steps, will, if continued, commence always with the same Foot; the other Difference arising is, that in this last, the Body, as in the first, being brought upon the first Step by the Extension of the Leg, the other Foot comes strait forwards into the fourth *Position*, and makes the second Step, which transfers the Body thereupon, the other Foot coming up to the first *Position* as before. In Walking it was observ'd, That the Heel was always taken from the Floor first, and set down again first; but, in Dancing, it is otherwise, and especially after a Sink, the Toe always comes to the Floor first.

A *MARCH* (or, as the *French* call it, *Un Pas grave*) is perform'd from the fourth *Position*. In Sinking the Body comes Perpendicular to the Horizon on the foremost Foot; and in the Rise the Hind-foot is mov'd obliquely, forward to the short second *Position*, the Toe pointing to the Floor, and the Line of *In-*
nixion

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nixion continuing on the same Foot as before; then let the moving Foot continue its Motion; and by moving obliquely forwards the contrary way to what it did before with a strait Knee, it will arrive to the fourth Position; and the Line of *Propension* may fall either between both Feet; or otherwise, on the foremost Foot. The Arms in this Movement, as in the half *Coupee*, will be contrasted.

A *BOUND*, and a *Hop*, are both call'd Springing; their Difference arises, that the Springing of the one, is from one Foot to the other, which is call'd a *Bound*; and in the other, the Weight of the Body falls on the same Foot from which it took its Spring, and is call'd a *Hop*.

A *BOUND* is taken from either of the *Positions*, except the fifth; and differs from the half *Coupee* in this, that as in the one (*viz.* the *half Coupee*) the Body always bears on the Floor, either on one Foot or the other, as in Walking; and in the *Bound*, the whole Machine is lifted up, or thrown from the Floor, as in Running, &c.

A *HOP* is perform'd from all the *Positions*: From the first and third the Line of *Innixion* falls on one Foot, and the Sink, as Preparatory to the *Hop*, is with both Knees; a brisk Extension from this Flexion throws the whole Body from the Floor, and the Body falls on the same Foot from which it principally receiv'd its Rise. From the second, fourth,
and

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and fifth *Positions*, the Line of *Innixion* will generally fall between both Feet, and both Feet, as it were, spring from the Floor together, but do not really, in effect, do so; for the Fall ought to be on that Foot which last left the Floor, and, which contrjbutes most to this Spring: Sometimes the Line of *Innixion*, in this Step, will fall on one Foot. Many of the young Practitioners in our Profession, are apt to mistake in the Movements of this Step; and more especially, in what we call *Contre Temps*, or *Compos'd Hops*.

I HOPE these few Observations may be sufficient to evidence, how necessary it is, that such Rules as have been here advanc'd, should be apply'd to all the Steps and Movements in Dancing; yet I must, at the same Time, confess, that there is a certain Carriage of the Body and Limbs, in the Performance of almost all Steps in *Dancing*, which gives a peculiar Grace and Air to the Motion; which is not only very difficult to attain; but much more so, to lay down Rules for them.

Musick. I am very well satisfy'd it is not expected from me; that I should use any Endeavours to prove, how useful *Musick*, in relation to Sounds, is to the Art of *Dancing*; since 'tis sufficiently obvious, that *Dancing* cannot be perform'd without its Assistance; and, that the Beauty of the Performance, does not a little depend upon the Har-

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Harmony arising from the Motion of the *Dancer*, justly adapted to the Sounds of the *Instruments*; and the meanest in our Profession cannot be ignorant, how necessary a small Skill in the practic Part of this Science, is to every one who professes himself a Master; nor will he deserve that Name, except he be also capable of instructing those under his Care with such a Knowledge of Sounds, as they might justly adapt the Motion of the Body, and Parts thereof, to the Time of the *Musick*. But before I proceed, it is necessary to inform you, That what I shall farther advance upon this Subject of *Dancing*, is only calculated for *Dramatick Performances*; and, when I speak of a Knowledge in *Musick*; *Rhetorick*; and *Painting*; I would be understood only, as they are necessary Qualifications, for such who intend to arrive to the utmost Perfection of this Art, or design to apply themselves intirely to the Stage, and in the Composition of *Opera Performances*, or of *Dramatick Entertainments in Dancing*. It is therefore requisite, for such a Master in our Art, to have, not only an universal Knowledge in *Dancing*, and to apply himself to the Study, and Consideration of all *Characters*; but also, so much Skill in *Musick*, as, at least, to be able to give Instructions to a Master in *Musick* for the Composition of his *Airs*; to judge, whether such *Musick* express well his *Ideas*; be justly apply'd to his *Design*; and well adapted to the *Characters*.

he

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he would represent ; nor should he be wanting in the practical Part, whereby to capacitate him (in a peculiar Taste, or Manner appropriated to our Art) to inspire, and give a Spirit to his Performers. How happy therefore, would it be, were a Master in *Dancing* so far skill'd in *Musick*, as to be capable of making, and composing his own *Airs* ; for though our Nation, and especially LONDON, is supply'd with Masters in *Musick*, equal with any in EUROPE ; yet would it not be a little difficult to find one, capable of giving into the Design, or troubling himself with entering into, or receiving the *Ideas*, or Notions of the *Dancing Master*. Though it was my good Fortune, when I compos'd the Entertainment of MARS and VENUS, to be recommended to Mr. SYMONDS, of whom I shall say no more, than, that the *Symphonies* he was so kind to give me for that Entertainment, were so well suited to the Subjects they introduc'd, that they sufficiently shew'd the Skill of the Composer, at the same Time as they imbellished the *Performance* : Nor, was its good Reception by the Town less owing to the musical *Airs* of the *Dancing Parts*, compos'd by Mr. FIRBANK, who, by a just adapting his Sounds to the Passions, and Affections of that *Entertainment* ; as likewise, to those of ORPHEUS and EURYDICE, has evidently demonstrated (as he is one of the first in our Art of *Dancing*) how necessary a Knowledge in *Musick*, is to those

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those of our Profession, who attempt *Dramatick Entertainment* of this, or the like kind.

Rhetorick. IT now behoves us to inform our selves, what Use a Knowledge of *Rhetorick* will be to us in our Profession; and such Knowledge is only requir'd of a Master of *Dramatick Dances*; and then only, as far as such *Dances* have relation to the *Manners, Passions, &c.*

RHETORICK is an Art of Eloquence, which arises from an elegant Choice of Words, persuasive, and of such Force, as so to express the Passions, as to raise, or allay the Affections of Man. What *Rhetorick* is to the *Orator* in Speaking, is to the *Dancer* in Action; and an Elegance of Action consists, in adapting the Gesture to the Passions and Affections; and the *Dancer*, as well as the *Orator*, allures the Eye, and invades the Mind of the Spectator; for there is a Force, and Energy in Action, which strangely affects; and when Words will scarce move, Action will excite, and put all the Powers of the Soul in a ferment.

AND, as it is the Business of a *Dancer* of this kind, as well as the *Rhetorician*, to treat the Characters of the Passions, he ought to take care, that his Subjects, and the Action arising from them, have nothing in them *Immoral, Low, or Indecent.*

I SHALL only add, That as there are many Passions, as *Love; Hatred; Grief; Joy; De-*

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Despair, Hopes, Fear, Anger, &c. and others of a lesser Degree, which may be call'd Affections; as *Tranquility; Grace; Civility; Gentleness;* and the like; so there are, not only different Actions for these different Passions, and Affections; but also, Variety of Actions, for each of these Passions, or Affections; all which the Dancer ought to know, and how to vary, as his Judgment shall direct him; and to be elegant in his Choice.

Painting. LASTLY, How Advantagious it must be for a *Stage Dancer, and Master,* to make himself acquainted with Paintings, Drawings, and Prints; and, to make a perfect Judgment of those that are Good, will appear from an Analogy between *Dancing and Painting.*

THE *Dancing Master,* as well as the *Painter,* ought to be endued with a Genius capable of expressing the Passions he would represent; and to make the Dumb, as it were, to speak; he ought to give his Performers, as the *Painter* does his Pictures, proper * Attitudes, that may be regular, agreeable, and justly contrasted by contrary Motions, and preserve the Body carefully pois'd on its own Center; his Contrast should be always natural, and never extravagant; he ought to be well acquainted with *Ordonnance, or Disposi-*

* *Attitude is a Posture, or graceful Disposition of the Body, in Standing; Sitting; or Lying.*

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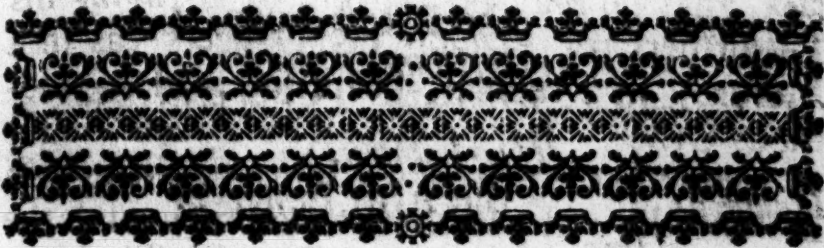
tion, that he may be capable of *Grouping* his Performers, or *Placing* his Dancers (as in a Picture) in a regular, beautiful, and harmonious Order. His principal Performer ought to appear in the principal Light, to distinguish it from the rest; so that it may first catch the Eye; and the rest of the *Dancers* should be as Members to the Action, as growing out of it, and not inserted into it.

LET his *Attitudes* be suitable to his Subject, so as to express the Thoughts and Conceptions of the Mind, by the Motions of the Eyes, Hands, and whole Body.

THE *Dancer* will, without Dispute, find great Assistance from his Acquaintance with *Painting* and *Prints*, in the Choice of his *Attitudes*; in the *Contrasting* his Actions; and, in a just Imitation of the Passions; because the Actions produc'd, and the Variety of the Motions arising from them, in representing such Passions; will never fail of moving, and giving Delight to the Spectator.

I AM perswaded, by what has been advanc'd in these Lectures, it will appear, That a Knowledge in *Anatomy*; *Mechanicks*; and *Musick*; is not to be slighted by the Professors of the Art of *Dancing*, and that a small Acquaintance with *Rhetorick* and *Painting*, as far as they relate to the Manners and Passions; are absolutely required from the *Master*, who intends to arrive to the utmost Perfection of the Art of DANCING.

THE



THE
NAMES
OF THE
BONES

Mention'd in these

LECTURES.

Os Occipitis the hinder Part of the Head, 1.

<i>Vertebrae</i>	{ <i>Cervicis,</i>	of the Neck, 7.
	{ <i>Dorsi,</i>	of the Back, 12.
	{ <i>Lumborum,</i>	of the Loins, 5.
<i>Os Sacrum</i>	the Basis of the <i>Vertebrae</i> , 6.	
<i>Os Coccygis</i>	the Rump Bone, 3.	
<i>Scapulae</i>	the Shoulder Blades, 2.	
<i>Claviculae</i>	the Collar Bones, 2.	

<i>Costæ</i>	the Ribs, 24.
<i>Sternum</i>	the Breast Bone, 1.
<i>Ossa Innominata</i>	<i>Os Ilium,</i> <i>Os Pubis,</i> <i>Os Ischium,</i> } the Hip Bones, 2.
<i>Humerus</i>	the Arm Bone, 2.
<i>Cubitus</i>	<i>Ulna,</i> <i>Radius,</i> } the fore Arm, 4.
<i>Carpus</i>	the Wrist Bones, 16.
<i>Metacarpus</i>	the Hand Bones, 8.
<i>Digiti</i>	the Fingers, 30.
<i>Femur</i>	the Thigh Bone, 2.
<i>Rotula</i>	the Knee Pan, 2.
<i>Tibia,</i> <i>Fibula,</i> }	the Leg Bones, 4.
<i>Tarsus</i>	the Ankle Bones, 14.
<i>Metatarsus</i>	the Bones of the Feet, 10.
<i>Digiti</i>	the Toes, 28.

<i>Atlas,</i>	the first	} <i>Vertebra.</i>
<i>Epistrophæus,</i>	the second	
<i>Axii,</i>	the third	
<i>Olecranium</i>	the Tip of the Elbow,	
<i>Os Calcis</i>	the Heel Bone.	



A
T A B L E
OF THE
M U S C L E S

Made Use of in these

L E C T U R E S.

The MUSCLES that move the Head.

<i>Splenius,</i>	}	move the Head back-
<i>Complexus,</i>		wards.
<i>Rectus major,</i>	}	nod the Head back-
<i>Rectus minor,</i>		wards.
<i>Obliquus inferior,</i>	}	perform the semicircu-
<i>Obliquus superior,</i>		lar Motion of the
<i>Mastoidæus,</i>		Head.
<i>Rectus internus major,</i>	}	nod the Head forwards.
<i>Rectus internus minor,</i>		
<i>Rectus Lateralis,</i>		nod the Head to one side.

The

The MUSCLES that move the Neck;
Back; and Loins.

<i>Longus,</i>	{ bend the <i>Vertebra</i> of
<i>Scalenus,</i>	{ the Neck.
<i>Musculi Vertebrales,</i>	{ pull the Neck back-
<i>Spinalis Colli,</i>	{ wards.
<i>Longissimus Dorfi,</i>	{ keeps the Body erect.
<i>Transversalis Dorfi,</i>	{ moves the Body ob-
	{ liquely backwards.
<i>Inter Spinalis,</i>	{ draws the acute Procef-
	{ ses nearer one ano-
	{ ther.
<i>Quadratus Lumborum,</i>	{ draws the <i>Vertebra</i> of
	{ the Loins to one side.

The MUSCLES of the Scapula.

<i>Serratus minor Anticus,</i>	{ draws the Shoulder
	{ Blades forwards.
<i>Trapezius,</i>	{ moves them upwards,
	{ backwards and down-
	{ wards.
<i>Rhomboides,</i>	{ pulls them backwards.
<i>Levator Scapula,</i>	{ pulls the Shoulder
	{ Blades upwards.

MUSCLES moving the Arm.

<i>Deltoides,</i>	{	lift the Arm upwards.
<i>Supra Spinatus,</i>		
<i>Coraco Brachialis,</i>	{	pull the Arm downwards.
<i>Latissimus Dorsi,</i>		
<i>Teres major,</i>	{	moves the Arm forwards.
<i>Pectoralis,</i>		
<i>Transversalis,</i>	{	draw the Arm backwards.
<i>Infra Spinatus,</i>		
<i>Subscapularis,</i>		

MUSCLES moving the Fore-Arm.

<i>Biceps,</i>	{	bend the Fore-Arm.
<i>Brachialis internus,</i>		
<i>Longus,</i>	{	extend the Fore-Arm.
<i>Brevis,</i>		
<i>Brachialis externus,</i>		
<i>Anconæus,</i>		

MUSCLES moving the Hand.

<i>Pronator Teres,</i>	{	turn the Palm of the Hand downwards, & is call'd Pronation.
<i>Rotundus,</i>		
<i>Pronator Quadratus,</i>	{	turn the Palm of the Hand upwards, and is call'd Supination.
<i>Supinator Longus,</i>		
<i>Supinator Brevis,</i>		
<i>Palmaris,</i>		helps the Hand to grasp.

Pal-

<i>Palmaris Brevis,</i>	makes the Palm hollow.
<i>Cubitus internus,</i>	{ bend the Wrist.
<i>Radius internus,</i>	
<i>Cubitus externus,</i>	{ extend the Wrist.
<i>Radius externus,</i>	

MUSCLES moving the Fingers.

<i>Sublimis,</i>	{ bend the Fingers.
<i>Profundus,</i>	
<i>Extensor digitorum communis,</i>	{ extend the Fingers.
<i>Lumbricales,</i>	{ assist in bending the first
<i>Interossei interni,</i>	{ Joynt of the Finger.
<i>Interossei externi,</i>	{ draw the Fingers to
<i>Flexor Pollicis,</i>	{ the Thumb.
<i>Extensor primi,</i>	{ draw the Fingers from
<i>----- secundi,</i>	{ the Thumb.
<i>----- tertii,</i>	{ bends the Thumb.
<i>Internodii Pollicis,</i>	{ extend the Thumb.
<i>Tenar,</i>	
<i>Anti-Tenar,</i>	{ draws the Thumb from
<i>Abductor indicis,</i>	{ the Fingers.
<i>Extensor indicis.</i>	{ draws the Thumb to
<i>Hypotenar,</i>	{ the Fingers.
	{ draws the Finger to the
	{ Thumb.
	{ draws the little Finger
	{ from the rest.

MUSCLES

MUSCLES that move the Thigh.

<i>Psoas,</i>	}	bend the Thigh.
<i>Iliacus,</i>		
<i>Pectineus,</i>	}	extend the Thigh.
<i>Gluteus major,</i>		
<i>Gluteus minor,</i>		
<i>Gluteus medius,</i>		
<i>Triceps,</i>	}	pulls the Thigh inwards move the Thigh out- wards.
<i>Pyri formis,</i>		
<i>Gemini,</i>		
<i>Quadratus,</i>		
<i>Obturator internus,</i>	}	help a circular and ob- lique Motion in the Thigh.
<i>Obturator externus,</i>		

MUSCLES moving the Leg.

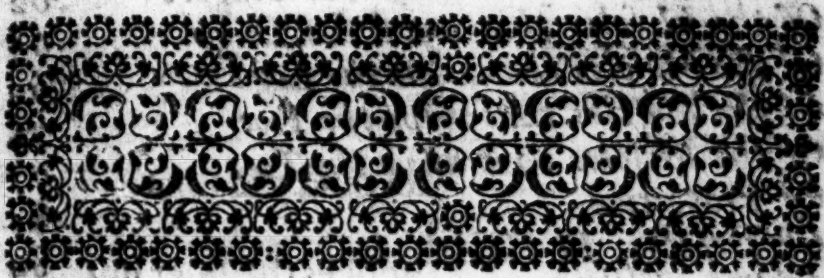
<i>Semi-nervosus,</i>	}	bend the Leg.
<i>Semi-membranosus,</i>		
<i>Biceps,</i>	}	extend the Leg.
<i>Gracilis,</i>		
<i>Vastus externus,</i>		
<i>Vastus internus,</i>		
<i>Crureus,</i>	}	cross the Legs. turns it a little out- wards. turn it a little inwards.
<i>Sartorius,</i>		
<i>Membranosus,</i>		
<i>Popliteus,</i>		

MUSCLES moving the Feet.

<i>Tibialis Anticus,</i>	}	bend the Foot.
<i>Peroneus Anticus,</i>		
<i>Gastrocnemii,</i>	}	extend the Foot.
<i>Soleus,</i>		
<i>Plantaris,</i>		
<i>Tibialis Posticus,</i>		moves the Foot inwards
<i>Peroneus Posticus,</i>	}	moves the Foot outwards.

MUSCLES moving the Toes.

<i>Profundus,</i>	}	bend the four lesser Toes
<i>Sublimis,</i>		
<i>Lumbricalis,</i>	}	extend the four lesser Toes.
<i>Longus,</i>		
<i>Brevis,</i>		bends the great Toe.
<i>Flexor Pollicis,</i>		extends the great Toe.
<i>Extensor Pollicis,</i>		draws the great Toe
<i>Tenar,</i>	}	from the rest.
<i>Anti-Tenar,</i>		draws it to the rest.
<i>Flexor Pollicis longus,</i>		
<i>Flexor Pollicis brevis,</i>		
<i>Abductor minimi Digiti,</i>		
<i>Interossei interni,</i>		draws the Toes to the
	}	great Toe.
<i>Interossei externi,</i>		draws them from the
	}	great Toe.
<i>Transversalis,</i>		brings all the Toes close.



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